SPECIFICATIONS

REPAIR C-5 MAINTENANCE HANGAR DOORS
BUILDING 7040

WESTOVER AIR RESERVE BASE
CHICOPEE, MASSACHUSETTS

PROJECT NO. YTPM 94-0101

REPAIR C-5 MAINTENANCE HANGAR DOORS

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DIVISION 16 – ELECTRICAL

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DRAWING TITLE SHEET NO.

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 Project is located at Building 7040, Pull-Through Hangar, Westover Air Reserve Base, Massachusetts. The Contractor shall conduct all work as to cause the least interference possible to the normal activities of the neighboring facilities, surrounding streets, and parking areas.

A. YTPM 94-0101 - Modify Aperture Doors, Building 7040.

1. Project Description: The work consists of Project YTPM 94-0101; Modify Aperture Doors, Building 7040, which includes the design, fabrication, and installation of custom specialty aperture hangar doors, which consists of new 'C-5' aircraft form fitting closure system, complete and operational, consisting of weather-tight flexible foam collar and related structures and equipment.

2. Repair Components:

a. Aperture closure door system.
b. Aperture opening framing.
c. Aperture door control systems.
d. Hangar door control interface.

3. The repair work includes the following:

a. Structural steel fabrication and erection.
b. Metal siding.
c. Painting.
d. Electrical wiring.
e. Aperture door: Product design, fabrication, and installation.
f. Contractor shall obtain exact dimensional drawing of the 'C-5' aircraft fuselage.

1.2 DRAWINGS

A. The Contractor shall thoroughly review the drawings and technical provisions and report any discrepancies or unacceptable details discovered herein to the Contracting Officer.

1.3 PHASING OF THE WORK

A. The Contractor shall not begin any construction or perform any other physical work at the construction site until the particular submittals identified in Section

01300 "Submittals" are received and approved by the Contracting Officer.

B. The Contractor shall coordinate all phases of the work with the Contracting Officer. Contractor's Schedule of Work Plan shall be submitted within ten (10) calendar days after receipt of the written Notice to Proceed for approval by the Contracting Officer.

1.4 SITE AVAILABILITY

A. Project area(s) will be available for contract work between 7:30 AM (0730) and 4:15 PM (1615). If the Contractor needs to perform work during hours or days other than the hours or workdays stated, a written request shall be submitted seven (7) days prior to required start of work. Requests shall include number of work hours, starting times, and dates of proposed work.

1.5 WORK REQUIREMENTS

A. No equipment or vehicles shall be left on the streets or blocking sidewalks during off work time. No parking will be allowed on grass areas.

B. Contractor shall provide non-combustible or self-extinguishing material drop cloths to isolate areas exposed to dust, debris or noise, or to cover material storage during construction in building interiors.

C. Contractor shall take necessary care to ensure inclement weather does not damage Government property and schedule work so as to minimize its impact on progress of the work.

D. At the end of each work day, the Contractor shall protect all entrances and/or exterior openings to the work area.

E. No work will be permitted overhead of Government personnel or aircraft unless barriers and guarding devices are used that meet the Contracting Officer's approval.

F. The area within 25 feet of an aircraft shall be classified as per NEC Article 513. No demolition/construction work, material storage, vehicle storage, or movement/personnel, etc.; nothing shall be done within 25 ft. of the aircraft. No welding or open flame allowed inside of the hangar when an aircraft is inside of the hangar.

G. Contractor will be provided specific C-5 aircraft fuselage cross sectional dimensions to be used in the

fabrication of the foam collar closure system from the government subsequent to contract award. Dimensions are required at aircraft station 2300.00 cut at 13 degrees 30 minutes to the left of aircraft centerline as shown on drawings.

1.06 INTERRUPTIONS/UTILITY SHUTDOWNS

A. Interruptions shall be defined as any Contractor operation which interferes with access through, or use of, facilities or areas including utilities, Energy Monitoring and Control System (EMCS), parking lots, generators, roads, or airfields.

B. Request for an interruption shall be submitted in writing and include the following information: Locations of interruption(s); Hours and Dates of Interruption(s); Which services are affected. Requests shall be submitted at least fifteen (15) working days in advance of the date desired and include at least one alternate date. Contractor is cautioned that outages may not be granted on the date(s) requested, therefore, Contractor shall notify the Contracting Officer at least five (5) working days in advance of any cancellation of any scheduled interruption. Services shall not be interrupted until receipt of approval of proposed hours and dates is received from the Contracting Officer.

C. Where fire protection, detection or evacuation alarms are affected, written approval from the Chief, Fire Technical Services shall be obtained through the Contracting Officer.

1.07 SANITARY FACILITIES

A. Contractor shall provide own chemical sanitary toilet(s). Location will be determined by the Contracting Officer. Chemical toilet will be subject to Government inspection by the Base Medical Officer. All sanitary deficiencies shall be corrected within 24 hours of the inspection.

1.08 REMOVAL AND REPLACEMENT RESPONSIBILITY

A. Replace or repair all existing finished surfaces, utilities, equipment, products, vegetation, and structures or parts thereof that have been damaged, or have to be removed, or cut into by the Contractor in order to perform work specified in this project.

1.09 QUALITY ASSURANCE

A. All items of work not addressed in these Technical Provisions shall be completed in strict accordance with

the manufacturer's Specifications.

B. The contents of the Technical Provisions shall govern in all situations, except where they conflict with the manufacturer's warranty requirements. All procedures necessary to obtain the specified manufacturer's warranty shall be followed.

C. The quality assurance procedures of this Section are a minimum. Provide additional quality control as required by the Contracting Officer. Additional quality control shall not constitute a change in the Contract.

D. The Government is not obligated to inspect the Contractor's work, nor protect the Contractor from the consequences of such work. The Government inspection is a general examination of the Contractor's conduct and workmanship and is solely for the purpose of the Government. Government inspectors do not have the authority to accept work, nor is the Government inspection to be construed as conclusive.

E. Government agents, including inspectors, engineers, and quality assurance evaluators are not authorized to change the Contract without the written approval of the Contracting Officer, this lack of authority extends to all situations in which the actions of these agents could be considered as constituting a change to the Contract.

F. The quality of workmanship is subject to audit by the Government or Government designated inspectors at any time during the Contract. The Contractor shall cooperate fully and provide all information necessary for this audit.

G. The Contractor shall engage a qualified testing laboratory at no additional cost to the Government. The Contracting Officer shall be notified prior to all tests, which shall be conducted in a timely manner so as not to impede the progress of the work. The Contractor shall conduct all tests as required by the Contract Documents and the Contracting Officer.

H. The Contractor shall institute immediate action to correct all variances from the Contract and employ all procedures necessary to ensure future work shall conform to the requirements of the Contract.

I. Submit all requests for changes in writing to the Contracting Officer. Do not proceed with changes without possession of written authorization of the Contracting Officer.

J. All materials shall be transported, delivered, handled, and stored in a manner recommended by the manufacturer so as to prevent their damage or contamination. All materials shall be delivered in their original unopened containers with their descriptive labels clearly visible and legible. All materials susceptible to aging or curing shall be stored with the descriptive labels, including manufacturing date and shelf life, clearly visible and legible. All materials which have exceeded their shelf life shall be rejected by the Quality Controller.

1.10 QUALITY CONTROL

A. The Contractor shall complete Form 439 AW Form 0-15, Daily Report to Inspector (attached at the end of this section) on a daily basis and submit to the Contracting officer prior to the commencement of work on the next day, or as instructed by the Contracting Officer.

B. The Contractor shall notify the Contracting Officer prior to the commencement of all components schedules for enclosure. The Contracting Officer shall approve all such work prior to the commencement of installation of finish materials.

C. The Contractor shall furnish one accurate Fahrenheit thermometer and install it to measure exterior site temperatures. High and low temperature shall be recorded each day on Daily Observation Report included in this Section.

1.11 SAFETY PRECAUTIONS

A. The Contractor shall comply with all applicable Federal, State and local legal requirements regarding workers health and safety. The requirements include, but are not limited to, those found in Federal and State Occupational Safety and Health Act (OSHA) statutes and regulations, such as applicable provisions of Title 29, Code of Federal Regulations (CFR) Parts 1910 and 1926. Contractor is solely responsible for determining the legal requirements that apply to his activities, and Contractor must ensure safe and healthful working conditions for its employees.

B. Contractor shall assume the responsibility to guard against causing of fires and/or explosions and to protect Government property.

C. The Contractor shall perform the work in a manner consistent with the building security and fire safety regulations especially with regard to exits and exitway access and shall comply with the Base Fire Regulations as

set forth in the 439 AW Instruction 32-2001. Temporary closures shall not compromise building security or fire safety for building occupants.

D. Provide proper fire prevention and extinguishing equipment in the immediate area of cutting torch or welding activity and immediate area of work involving use of flammable liquids.

E. The Contractor shall receive from the fire protection branch a permit for all cutting, welding, and soldering. All permits shall be prominently displayed during all construction.

F. Work on Primary and Secondary Cables: Contractors shall follow the provisions of 29 CFR 1926, Subpart K.

1.12 HAZARDOUS MATERIAL REPORTING:

A. The Contractor shall maintain hazardous material inventories and material safety data sheets (MSDS) for all hazardous materials (as defined in CFR 1910.120, 40 CFR's 355, 370, & 372) to be stored and used on this installation. Hazardous materials must be inventoried when received and at project completion. The amounts used shall be maintained for the project duration, and for the calendar year (ending 31 December).

B. Hazardous Materials Inventories, Material Safety Data Sheets and material quantities used shall be submitted to the Contracting Officer for approval utilizing 439 AW Form 20, CONTRACTOR INFORMATION SHEET, at the end of this Section.

C. In the event of a spill, Contractor shall immediately notify the Base Fire Department at extension 911 as well as the Contracting Officer. The Contractor shall be solely responsible for the expense of any cleanup of such spill, and the cleanup shall be in accordance with the applicable provisions of 40 CFR Part 761.

1.13 DUST CONTROL

A. Dust Control Plan: Submit proposed plan in writing to the Contracting Officer within five (5) days after issuance of the Notice to Proceed. Plan will describe proposed method used in the prevention of dust and paint fumes due to construction operations in the project site/area, along haul routes, and in equipment parking/staging areas.

1.14 USE OF EXPLOSIVES

A. The use of explosives is prohibited.

1.15 BARRIERS/TRAFFIC CONTROL

A. Contractor shall provide all necessary barriers and barricades at and around all work areas.

B. All barricades shall be provided with a flashing light. Flashing lights shall be maintained to operate nightly during construction. Contractor shall check each flashing light for operation every night before leaving the project area.

C. A flag person shall be provided when operations or equipment are adjacent to or on base roads. Exception shall be made only when an adequate mechanical signaling or control device is provided for safe direction of traffic.

1.16 MECHANICAL EQUIPMENT

A. All self propelled construction equipment operated on the project, whether moving alone or in combination, shall be equipped with an automatic signal alarm which sounds off while the equipment moves in reverse. Alarm may be continuous or intermittent and shall be audible for a distance of 200 feet, irrespective of the conditions and circumstances under which the equipment is being operated. Alarms shall operate under initial backward movement, and if intermittent shall sound at intervals not to exceed three (3) seconds.

1.17 PROJECT RECORD DOCUMENTS

A. Contractor shall provide to the Contracting Officer, upon completion of the project, a complete set of project documents consisting of Record Drawings and Operation and Maintenance Data. Record Drawings shall include original marked-up set of all Drawings whether changed or not. The information provided shall include, but not be limited to, the following:

1. Dimensional changes
2. New and revised details
3. Actual routings of piping and conduits
4. Revisions to electrical circuits
5. Actual equipment locations
6. Locations of utilities concealed in construction
7. Particulars on concealed products which will not be easily identified later
8. Changes made by modifications to the Contract

1.18 TRAINING SESSIONS:

A. The Contractor shall videotape all training sessions on VHS tapes. Prior to all training sessions, the Contractor shall submit all required manuals.

1.19 DAILY REPORT:

A. The following Form 439 AW Form 0-15, Daily Report to Inspector, is to be utilized for daily reporting of all project activity.

DAILY REPORT TO INSPECTOR		DATE
CONTRACT NO#	TITLE AND LOCATION YTPM 94-0101, Repair C-5 maintenance Hangar Doors	REPORT NO#
CONTRACTOR (Prime or Subcontractor)		NAME OF SUPERINTENDENT OR FORMAN
WEATHER – A.M.		TEMPERATURE – A.M.
WEATHER – P.M.		TEMPERATURE – P.M.

PRIME CONTRACTOR/SUBCONTRACTOR WORK FORCE *(If space provided below is inadequate, use additional sheets)*				LOCATION AND DESCRIPTION OF WORK PERFORMED
NUMBER	TRADE	HOURS	EMPLOYER	
TOTAL WORK HOURS ON JOB SITE THIS DATE				
CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT				
TOTAL WORK HOURS FROM START OF CONSTRUCTION				

INSPECTION AND/OR TESTING PERFORMED TODAY-FOLLOW WITH REPORT	LOCATION AND/OR ELEMENT OF WORK	REMARKS RESULTS OF INSPECTIONS/TEST

439 AW FORM 0-15

SPEC, PARA OR DRAWING NO#	EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (*Description, Sizes, Quantity)*	SUBMITTAL NO# OR CERTIFICATIO N	DATE APPROVED

SPEC, PARA OR DRAWING NO#	LOCATION AND DESCRIPTION OF DEFICIENCIES *(Materials, Equipment, Safety, and/or workmanship)* ACTION TAKEN OR TO BE TAKEN

DEFICIENCIES CORRECTED THIS DATE	REFERENCE	
	REPORT NO#	COMPLIANCE NOTICE NO#

CONSTRUCTION AND PLANT EQUIPMENT LEFT ON JOB SITE UNTIL USE IS COMPLETED

DESCRIPTION	DATE FIRST ON JOB (First time only)	HOURS WORKED THIS DATE	HOURS IDLE	DATE OR FINAL REMOVAL FROM JOB SITE

CONSTRUCTION AND PLANT EQUIPMENT NOT LEFT ON JOB SITE PERMANENTLY *(This will include pickup trucks and mobile mounted items, such as compressors are also used for transportation to and from the job)*

DESCRIPTION	HOURS WORKED	HOURS IDLE

CONTRACTOR/SUPERINTENDENTS SIGNATURE	DATE

439 AW FORM 0-15

CONTRACTOR INFORMATION SHEET

PROJECT NAME: Repair C-5 Maintenance Hangar Doors

PROJECT NUMBER: YTPM 94-0101

COMPANY NAME:

DATES OF CONTRACT:

LOCATION ON BASE:

TELEPHONE NUMBER *(On base, if available):*

NAME OF CONTACT:

SHOP CODE *(Assigned by HAZMART):*

MATERIAL INFORMATION

MATERIAL NAME/ PART NUMBER	MFR	CONTAINER TYPE	QTY	SIZE	TOTAL QTY TO BE USED *(Estimated)*	NSN/LSN TO BE FILLED IN BY PHARMACY PERSONNEL

439 AW FORM 20, JUN 00 *(EF-V1)*

-- End of Section --

SECTION 01011

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 The work covered by this section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract. Environmental pollution is defined as the presence of chemical, physical or biological elements or agents which can adversely affect human health or welfare, or unfavorably alter ecological balances of importance to humankind. The control of environmental pollution requires consideration of air, ground water, surface water and land.

1.2 APPLICABLE REGULATIONS

In order to prevent, and to provide for abatement and control of any environmental pollution arising from construction activities, the contractor in the performance of this contract shall comply with all applicable federal, state and local laws and regulations concerning environmental pollution control and abatement.

1.3 NOTIFICATIONS

The Contracting Officer will notify the contractor in writing of any non-compliance with foregoing provisions and the action to be taken. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or authorized representative at the site of the work, shall be deemed sufficient for the purpose of notification. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop order shall be made the subject of any claim for extension of time or for excess costs or damage by the contractor unless it is later determined that the contractor was, in fact, in compliance.

1.4 SUBCONTRACTOR

Compliance with the provisions of this contract by subcontractors shall be the responsibility of the contractor.

1.5 IMPLEMENTATION. Prior to commencement of the work the contractor shall do the following:

A. The Contractor shall submit an Environmental Control Plan for approval, containing proposals for implementing this section for environmental pollution control to include the SWPPP noted below.

B. Meet with representatives of the Contracting Officer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.

1.6 PROTECTION OF WATER RESOURCES

The contractor shall not pollute ground water, streams, lake or reservoirs with fuel oils, bituminous, calcium chloride, acid, construction wastes or other harmful materials. It is the responsibility of the contractor to investigate and comply with all applicable federal, state, county and local laws and regulations concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in streams through or adjacent to the project areas.

1.7 DUST CONTROL

The contractor shall maintain all work areas free from dust which could contribute to air pollution or interfere with airfield operations. The approved method of dust stabilization is sprinkling with water. Sprinkling must be repeated at such intervals as to keep all parts of the disturbed area free of dust at all times, and the contractor must have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds, and whenever a dust nuisance or hazard occurs.

1.8 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this contract, the contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out, or until the materials concerned have become stabilized to the extent that pollution is no longer created.

1.9 HAZARDOUS MATERIALS & HAZARDOUS MATERIALS REPORTING

A. Any hazardous wastes generated by the contractor are the responsibility of the contractor for proper management and disposal. This material must be properly labeled, stored, manifested, transported and disposed of in accordance with the latest Environmental Protection Agency and Massachusetts Department of Environmental Protection rules and regulations.

1. Contractor shall submit MSDS's to the Contracting Officer, for all hazardous materials as specified in 29 CFR 1910.1200. A hazardous material is any product that has a Material Safety Data Sheet (MSDS).

2. Before project start, contractor shall submit to the Contracting Officer a complete list of all hazardous materials that will be used during construction, total amount that will be stored on the base at any time, and all MSDS's for the products.

3. Hazardous materials must be stored in accordance with NFPA standards and may be inspected by the Contracting Officer at any time.

4. At project completion, the contractor shall submit to the Contracting Officer a complete list of the hazardous materials used. The list shall include the amount used and the process it was used for.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION 01012

AFFIRMATIVE PROCUREMENT

PART 1 GENERAL

APPLICABILITY

1.1.1. These procedures apply to Contractors and subcontractors employed in the construction of projects at Westover ARB, MA. All contractors, subcontractors, equipment suppliers, and material suppliers are responsible for compliance with this specification, with respect to those items/products listed on the AFFIRMATIVE PROCUREMENT REPORTING FORM.

DOD AND AIR FORCE REQUIREMENTS

1.1.2. In accordance with the Resource Conservation and Recovery Act, Executive Orders 12873 and 13101, Department of Defense (DOD) Instruction 4715.4, and the Air Force Pollution Prevention program, Westover ARB must ensure that purchases of all EPA designated Comprehensive Procurement Guideline items comply with EPA recommended recycled-content requirements. This specification section contains guidelines for implementing the RCRA, EO, DOD, and Air Force requirements.

1.1.3. The guideline items and U.S. EPA recommended minimum recycled content levels, which are mandatory for Air Force procurements, are listed in the attached AFFIRMATIVE PROCUREMENT REPORTING FORM. Recycled products shall be used wherever possible subject to the following exemptions:

1.1.3.1. The product is not available from a sufficient number of sources to maintain a satisfactory level of competition (i.e., available from two or more sources).

1.1.3.2. The product is not available within a reasonable period of time.

1.1.3.3. The product does not meet the performance standards in applicable specifications or fails to meet reasonable performance standards of the procuring agency.

1.1.3.4. The product is not available at a reasonable price. For Air Force purposes, "unreasonable price" is defined as follows:

If the price of the recycled-content product exceeds that of a non-recycled item, then the price is considered unreasonable.

CONTRACTOR RESPONSIBILITY

1.1.4. The Contractor shall complete the AFFIRMATIVE PROCUREMENT REPORTING FORM with respect to the work and products being provided. The Prime Contractor is responsible for insuring that all sub-contractors comply with this requirement.

1.1.5. Each contractor shall provide written documentation to support his/her decision not to acquire items meeting the minimum content levels. This documentation shall be forwarded to the Contracting Officer for review and approval.

1.1.6. In the event that the documentation fails to support the contractor’s findings, the Contracting Officer shall return the documentation to the Contractor citing the reason(s) for disapproval. The Contractor shall resubmit and address the deficiencies.

PART 2 PRODUCTS

U.S. EPA DESIGNATED ITEMS.

The AFFIRMATIVE PROCUREMENT REPORTING FORM shall be used to demonstrate compliance with the stated procurement requirements. The list contained in the form includes items from the categories of Construction, Landscaping, Parks & Recreation, Transportation, and Miscellaneous Products. These materials may or may not be required in the construction of this project. Refer to the drawings and specifications.

Affirmative Procurement Reporting Form

(PER EXECUTIVE ORDER 13101)

PROJECT NUMBER: YTPM 94-0101

BLDG NUMBER: 7040

PROJECT MANAGER: _____

PROJECT INSPECTOR: _____

CONTRACTOR: _____

Instructions (to the Contractor): Complete and submit this form to the Contracting Officer, 250 Airlift Drive, Westover ARB. The 439SPTG Civil Engineering construction inspector should submit this data to 439SPTG Civil Engineering Environmental Flight (CEV) IAW E.O. 13101, Federal Acquisition, Recycling, and Waste Prevention.

The affirmative procurement categories represented in this listing include:
Construction, Landscaping, Parks & Recreation, Transportation, and Miscellaneous Products.

RECYCLED OR RECOVERED PRODUCT	% REQUIRED (MINIMUM) *	% AVAILABLE (ACTUAL)	QUANTITY USED/UI	EXEMPTED 1,2,3,4
-ROCK WOOL INSULATION	75%			
-FIBERGLASS INSULATION	20-25%			
-LOOSE FILL/SPRAY ON	75%			
-PERLITE COMP BOARD	23%			
-PLASTIC RIGID FOAM	9%			
-GLASS FIBER REINFORCED	6%			
-PHENOLIC RIGID FOAM	5%			
-STRUCTURAL FIBER BOARD	80-100%			
-PLASTIC, NON-WOVEN BATT	100%			
-LAMINATED PAPER BOARD	100%			
-CEMENT/CONCRETE (FLYASH)	SEE SPEC			
-CARPET (PET)	25-100%			

-CARPET CUSHION	15-100%			
-PATIO BLOCKS/RUBBER OR PLASTIC	90-100%			
-FLOOR TILES/RUBBER OR PLASTIC	90-100%			

* More than one type of recovered material or fiber (paper, metal, plastic, fly ash etc.) may be represented in the listing for “% Required (Minimum)”. The contractor should always consult the USEPA website CPG -- Products to obtain the exact recommended recycled content requirement for each type of recovered material or fiber that may be used in the manufacture of each product.

RECYCLED OR RECOVERED PRODUCT	**% REQUIRED (MINIMUM) ***	**% AVAILABLE (ACTUAL)**	**QUANTITY USED/UI**	**EXEMPTED 1,2,3,4**
-TRAFFIC CONES	50-100%			
-TRAFFIC BARRICADES	80-100%			
-PLAYGROUND SURFACES	90-100%			
-PLAYGROUND EQUIPMENT, PLASTIC	95-100%			
-PLAYGROUND EQUIPMENT, METAL	25-100%			
-SORBENTS, PAPER, WOOD, TEXTILES	95-100%			
-SORBENTS, PLASTIC	25-100%			
-RUNNING TRACKS	90-100%			
-PLASTIC FENCING	90-100%			
-PARK BENCHES AND PICNIC TABLES	15-100%			
-COMPOST FROM YARD TRIMMINGS & FOOD WASTE	SEE SPEC			
-WOOD OR PAPER BASED HYDRAULIC MULCH	100%			
-REPROCESSED WHITE, OFF-WHITE & PASTEL COLORS LATEX PAINT	20%			

-REPROCESSED GREY, BROWN, EARTHTONES & OTHER DARK COLORS LATEX PAINT	50-99%			
-CONSOLIDATED LATEX PAINT	100%			
-RAILROAD CROSSING SURFACES	15-100%			
-PARKING STOPS/PLASTIC OR RUBBER	100%			
-PARKING STOPS/CONCRETE CONTAINING FLY ASH OR GGBF	20-70%			
-FLOWABLE FILL	SEE SPEC			
-CHANNELIZERS, DELINEATORS	25-100%			
-FLEXIBLE DELINEATORS	25-85%			
-WOOD PALLETS	95-100%			
-PLASTIC PALLETS	25-100%			

* More than one type of recovered material or fiber (paper, metal, plastic, fly ash etc.) may be represented in the listing for “% Required (Minimum)”. The contractor should always consult the USEPA website CPG -- Products to obtain the exact recommended recycled content requirement for each type of recovered material or fiber that may be used in the manufacture of each product.

RECYCLED OR RECOVERED PRODUCT	**% REQUIRED (MINIMUM) ***	**% AVAILABLE (ACTUAL)**	**QUANTITY USED/UI**	**EXEMPTED 1,2,3,4**
-GARDEN AND SOAKER HOSES	60-70%			
-LAWN AND GARDEN EDGING	30-100%			
-LUMBER/LANDSCAPING TIMBER & POSTS	75-100%			
-COMPOST FROM YARD TRIMMINGS & FOOD WASTE	SEE SPEC			
-INDUSTRIAL DRUMS	25-100%			
-MANUAL GRADE STRAPPING	25-100%			
-SIGNS AND POSTS, PLASTICS	80-100%			
-SIGNS AND POSTS, METAL	25-100%			

-MATS	85-100%			
PLASTIC SHOWER & RESTROOM DIVIDERS/PARTITIONS	20-100%			

* More than one type of recovered material or fiber (paper, metal, plastic, fly ash etc.) may be represented in the listing for "% Required (Minimum)". The contractor should always consult the USEPA website CPG -- Products to obtain the exact recommended recycled content requirement for each type of recovered material or fiber that may be used in the manufacture of each product.

CERTIFICATION

I hereby certify the Statement of Work/Specifications for the requisition/procurement of all materials listed on this form complies with EPA standards for recycled/recovered materials content.

_____ _____ _____

Contractor Inspector Environmental Flight

The following exemptions may apply to the non-procurement of recycled/recovered content materials:

1) The product does not meet appropriate performance standards

2) The product is not available within a reasonable time frame

3) The product is not available competitively (from two or more sources)

4) The product is only available at an unreasonable price (compared with a comparable non-recycled content product.)

END OF SECTION

SECTION 01090

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. ASTM B 564 Nickel Alloy Forgings. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the organizations whose publications are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the sponsoring organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI) P.O. Box 9094 Farmington Hills, MI 48333-9094 Ph: 248-848-3700 Fax: 248-848-3801 Internet: http://www.aci-int.org	AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI) 4301 North Fairfax Dr., Suite 425 ATTN: Pubs Dept. Arlington, VA 22203 Ph: 703-524-8800 Fax: 703-528-3816 E-mail: ari@ari.org Internet: www.ari.org
AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA) 1712 New Hampshire Avenue, NW Washington, DC 20009 Ph: 202-483-9370 FAX: 202-588-1217 Internet www.acca.org	AIR DIFFUSION COUNCIL (ADC) 104 So. Michigan Ave., No. 1500 Chicago, IL 60603 Ph: 312-201-0101 Fax: 312-201-0214 Internet www.flexibleduct.org

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA) 30 W. University Dr. Arlington Heights, IL 60004-1893 Ph: 708-394-0404 Fax: 708-253-0088 Internet www.amca.org	ALUMINUM ASSOCIATION (AA) 900 19th Street N.W. Washington, D.C. 20006 Ph: 202-862-5100 Fax: 202-862-5164 Internet: www.aluminum.org
AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA) 1827 Walden Ofc. Sq. Suite 104 Schaumburg, IL 60173-4268 Ph: 847-303-5664 Fax: 847-303-5774 Internet: www.aamanet.org	AMERICAN CONCRETE PIPE ASSOCIATION (ACPA) 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 Ph: 972-506-7216 Fax: 972-506-7682 Internet: http://www.concrete-pipe.org e-mail: info@concrete-pipe.org
AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) 1330 Kemper Meadow Dr. Cincinnati, OH 45240-1634 Ph: 513-742-2020 Fax: 513-742-3355 Internet: www.acgih.org E-mail: pubs@acgih.org	AMERICAN FOREST & PAPER ASSOCIATION (AF&PA) American Wood Council ATTN: Publications Dept. 1111 Nineteenth St. NW, Suite 800 Washington, D.C. 20036 Ph: 800-294-2372 202-463-270 Fax: 202-463-2471 Internet: http://www.afandpa.org
AMERICAN GAS ASSOCIATION (AGA) 400 N. Capitol Street. N.W. Suite 450 Washington, D.C. 20001 Ph: 202-824-7000 Fax: 202-824-7115	AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001 Ph: 312-670-2400 Publications: 800-644-2400 Fax: 312-670-5403 Internet: http://www.aiscweb.org
AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC) 7012 So. Revere Parkway, Suite 140 Englewood, CO 80112 Ph: 303-792-9559 Fax: 303-792-0669	AMERICAN IRON AND STEEL INSTITUTE (AISI) 1101 17th St., NW Suite 1300 Washington D.C. 20036 Ph: 202-452-7100
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) 11 West 42nd St New York, NY 10036 Ph: 212-642-4900 Fax: 212-398-0023 Internet: www.ansi.org/	Acoustical Society of America P. O. Box 1020 Sweickley, PA 15143-9998 Ph: 412-741-1979 Fax: 412-741-0609 Internet: asa.aip.org

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT) 1711 Arlingate Lane P.O. Box 28518 Columbus, OH 43228-0518 Ph: 800-222-2768 Fax: 614-274-6899	AMERICAN SOCIETY FOR QUALITY (ASQ) 1711 Arlingate Lane P.O. Box 28518 Columbus, OH 43228-0518 Ph: 800-222-2768 Fax: 614-274-6899 Internet: www.asnt.org
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 Ph: 610-832-9585 Fax: 610-832-9555 Internet: www.astm.org	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE) 1791 Tullie Cir., NE Atlanta, GA 30329 Ph: 800-527-4723 or 404-636-8400 Fax: 404-321-5478 Internet: http://www.ashrae.org
AMERICAN SOCIETY OF SANITARY ENGINEERING FOR PLUMBING AND SANITARY RESEARCH (ASSE) 901 Canterbury, Suite A Westlake, OH 44145 Ph: 440-835-3040 Fax: 440-835-3488 E-mail: asse@ix.netcom.com Internet: www.asse-plumbing.org	AMERICAN WATER WORKS ASSOCIATION(AWWA) 6666 West Quincy Denver, CO 80235 Ph: 800-926-7337 Fax: 303-795-1989 Internet: www.awwa.org
AMERICAN WELDING SOCIETY (AWS) 550 N.W. LeJeune Road Miami, FL 33126 Ph: 305-443-9353 Fax: 305-443-7559 Internet: http://www.amweld.org	ARCHITECTURAL WOODWORK INSTITUTE (AWI) 1952 Isaac Newton Square Reston, VA 20190 Ph: 703-733-0600 Fax: 703-733-0584 Internet: www.awinet.org
ARMY ENVIRONMENTAL CENTER (AEC) 5179 Hoadley Road Aberdeen Proving Ground, MD 21010-5401 Internet: www.aec.army.mil	ARMY PAMPHLET (DAPAM) www.usapa.army.mil/news.htm

ASME INTERNATIONAL (ASME) Three Park Avenue New York, NY 10016-5990 Ph: 212-591-7722 Fax: 212-591-7674 Internet: www.asme.org	ASSOCIATED AIR BALANCE COUNCIL (AABC) 1518 K St., NW, Suite 503 Washington, DC 20005 Ph: 202-737-0202 Fax: 202-638-4833 Internet: www.aabchq.com
BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA) 355 Lexington Ave., 17th Floor New York, NY 10017-6603 Ph: 212-297-2100 Fax: 212-370-9047 Internet: www.buildershardware.com	BUILDING OFFICIALS & CODE ADMINISTRATORS INTERNATIONAL (BOCA) 4051 W. Flossmoor Rd. Country Club Hills, IL 60478 Ph: 708-799-2300 Fax: 708-799-4981 Internet: www.bocai.org E-mail: boca@aecnet.com
CAST IRON SOIL PIPE INSTITUTE (CISPI) 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421 Ph: 423-892-0137 Fax: 423-892-0817 Internet: www.cispi.org	CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA) 1500 Lincoln Highway, Suite 202 St. Charles, IL 60174 Ph: 708-584-1919 Fax: 708-584-2003 Internet: www.cisca.org
CODE OF FEDERAL REGULATIONS (CFR) Order from: Government Printing Office Washington, DC 20402 Ph: 202-512-1800 Fax: 202-275-7703 Internet: http://www.gpo.gov	COMMERCIAL ITEM DESCRIPTIONS (CID) Order from: General Services Administration Federal Supply Service Bureau 470 E L'Enfant Plaza, S.W. Washington, DC 20407 Ph: 202-619-8925 Internet: http://pub.fss.gsa.gov/h1-pub.html
CONCRETE REINFORCING STEEL INSTITUTE (CRSI) 933 No. Plum Grove Rd. Schaumburg, IL 60173-4758 Ph: 847-517-1200 Fax: 847-517-1206 Internet: http://www.crsi.org	CONSUMER PRODUCT SAFETY COMMISSION (CPSC) Washington, DC 20207 Ph: 301-504-0580 Internet: www.cpsc.gov

CORPS OF ENGINEERS (COE) Order CRD-C documents from: U.S. Army Engineer Waterways Experiment Station ATTN: Technical Report Distribution Section, Services Branch, TIC 3909 Halls Ferry Rd. Vicksburg, MS 39180-6199 Ph: 601-634-2664 Fax: 601-634-2388 Internet: www.libweb.wes.usac.army.mil/index.htm	COUNCIL OF AMERICAN BUILDING OFFICIALS (CABO) 5203 Leesburg Pike, Suite 708 Falls Church, VA 22041 Ph: 703-931-4533 Fax: 703-379-1546
DEPARTMENT OF COMMERCE (DOC) Order From: National Technical Information Service 5285 Port Royal Road Springfield, VA 22161 Ph: 703-605-6000 Fax: 703-605-6900 Internet: http://www.ntis.gov	DEPARTMENT OF DEFENSE (DOD) Order from: National Technical Information Service 5285 Port Royal Road Springfield, VA 22161 Ph: 703-605-6040 FAX: 703-487-4639
DOOR AND HARDWARE INSTITUTE (DHI) 14170 Newbrook Dr. Chantilly, VA 20151-2232 Ph: 703-222-2010 Fax: 703-222-2410 Internet: www.dhi.org E-mail: techdept@dhi.org	DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA) 245 Riverchase Parkway East, Suite 0 Birmingham, AL 35244-1856 Ph: 205-402-8700 Fax: 205-402-8730 Internet: www.dipra.org E-mail: info@dipra.org
ENGINEERING MANUALS (EM) USACE Publications Depot Attn: CEIM-SP-D 2803 52nd Avenue Hyattsville, MD 20781-1102 Ph: 301-394-0081 Fax: 301-394-0084 Internet: www.usace.army.mil	ENGINEERING PAMPHLETS (EP) USACE Publications Depot Attn: CEIM-SP-D 2803 52nd Avenue Hyattsville, MD 20781-1102 Ph: 301-394-0081 Fax: 301-394-0084 Internet: www.usace.army.mil
ENGINEERING REGULATIONS (ER) USACE Publications Depot Attn: CEIM-SP-D 2803 52nd Avenue Hyattsville, MD 20781-1102 Ph: 301-394-0081 Fax: 301-394-0084 Internet: www.usace.army.mil	ENVIRONMENTAL PROTECTION AGENCY (EPA) Public Information Center 401 M St., SW Washington, DC 20460 Ph: 202-260-2090 FAX: 202-260-6257 Internet: http://www.epa.gov NOTE: Some documents are available only from: National Technical

Information Services (NTIS) 5285 Port Royal Rd. Springfield, VA 22161 Ph: 800-553-6847 Fax: 703-321-8547 Internet: www.ntis.gov	EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA) 25 No. Broadway Tarrytown, NY 10591 Ph: 914-332-0040
FACTORY MUTUAL ENGINEERING AND RESEARCH (FM) 500 River Ridge Drive Norwood, MA 02062 Ph: 781-440-8000 Fax: 718-440-8742 Internet: www.fmglobal.com	FEDERAL SPECIFICATIONS (FS) Order from: General Services Administration Federal Supply Service Bureau 470 L'Enfant Plaza, S.W. Washington, DC 20407 Ph: 202-619-8925 Fax: 202-619-8978 Internet: http://pub.fss.gsa.gov/
FEDERAL STANDARDS (FED-STD) Order from: General Services Administration Federal Supply Service Bureau 470 E L'Enfant Plaza, S.W. Washington, DC 20407 Ph: 202-619-8925 Fax: 202-619-8978 Internet: http://pub.fss.gsa.gov/	GLASS ASSOCIATION OF NORTH AMERICA (GANA) 2945 SW Wanamaker Drive, Suite A Topeka, KS 66614-5321 Ph: 785-271-0208 Fax: 785-271-0166 Internet:www.glasswebsite.com

GYPSUM ASSOCIATION (GA) 810 First St. NE, Suite 510 Washington, DC 20002 Ph: 202-289-5440 Fax: 202-289-3707 Internet: www.gypsum.org	HYDRONICS INSTITUTE DIVISION OF GAMA (HYI) 35 Russo Pl. P.O. Box 218 Berkeley Heights, NJ 07922-0218 Ph: 908-464-8200 Fax: 908-464-7818 Internet: www.gamanet.org
ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA) 120 Wall St., 17th Floor New York, NY 10005-4001 Ph: 212-248-5000 Fax: 212-248-5017 Internet: www.iesna.org	INDUSTRIAL FASTENERS INSTITUTE (IFI) 1717 East 9th St., Suite 1105 Cleveland, OH 44114-2879 Ph: 216-241-1482 Fax: 216-241-5901 Internet: http://www.industrial-fasteners.org e-mail: indfast@aol.com
INSTITUTE OF ENVIRONMENTAL SCIENCES (IES) 940 East Northwest Highway Mount Prospect, IL 60056 Ph: 847-255-1561 Fax: 847-255-1699 Internet: www.iest.org	INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO) 20001 Walnut Dr., So. Walnut, CA 91789-2825 Ph: 909-595-8449 Fax: 909-594-3690 Fax for Stds: 909-594-5265 Internet: www.iapmo.org
INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO) 5360 Workman Mill Rd. Whittier, CA 90601-2298 Ph: 800-284-4406 Fax: 310-692-3853 Internet: icbo.org	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) 1, rue de Varembe' Case Postale 56 CH-1211 Geneve 20 Switzerland Ph: 41-22-749-0111 Fax: 41-22-733-3430 Internet: www.iso.ch e-mail: central@iso.ch
IRON & STEEL SOCIETY (ISS) 410 Commonwealth Dr. Warrendale, PA 15086-7512 Ph: 412-776-1535, ext. 1 Fax: 412-776-0430 E-Mail: custserv @ issource.org Internet: www.issourse.org	MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS) 127 Park St., NE Vienna, VA 22180-4602 Ph: 703-281-6613 Fax: 703-281-6671 Internet: www.mss-hq.com

MILITARY HANDBOOKS (MIL-HDBK) Order from: Standardization Documents Order Desk Bldg 4D 700 Robbins AV Philadelphia, PA 19111-5094 Ph: 215-697-5147 Fax: 215-697-5148 Internet: www.dodssp.daps.mil	MILITARY SPECIFICATIONS (MS) Order from: Standardization Documents Order Desk Building 4, Section D 700 Robbins Ave. Philadelphia, PA 19111-5094 Ph: 215-697-5147 Fax: 215-697-5148 Internet: www.dodssp.daps.mil
MILITARY STANDARDS (MIL-STD) Order from: Standardization Documents Order Desk Building 4, Section D 700 Robbins Ave. Philadelphia, PA 19111-5094 Ph: 215-697-2179 Fax: 215-697-2978 Internet: www.dodssp.daps.mil	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM) 8 So. Michigan Ave, Suite 100 Chicago, IL 60603 Ph: 312-782-4951 Fax: 312-332-0706 Internet: www.naamm.org
NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS (NAPHCC) 180 S. Washington Street P.O. Box 6808 Falls Church, VA 22046 Ph: 800-533-7694 Fax: 703-237-7442 Internet: www.naphcc.org	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) 1300 N. 17th St., Suite 1847 Rosslyn, VA 22209 Ph: 703-841-3200 Fax: 703-841-3300 Internet: http//www.nema.org/
NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB) 8575 Grovemont Circle Gaithersburg, MD 20877-4121 Ph: 301-977-3698 Fax: 301-977-9589 Internet: www.nebb.org	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 Ph: 617-770-3000 Fax: 617-770-0700 Internet: http://www.nfpa.org NOTE: The complete set of 1997 NFPA National Fire Codes (13 Vol.) is available for $835.00.

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET) 1420 King Street Alexandria, VA 22314-2794 Ph: 888-476-4238 Internet: www.nicet.org	NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH) Mail Stop C-13 4676 Columbia Parkway Cincinnati, OH 45226-1998 Ph: 800-356-4676 Internet: http://www.cdc.gov/niosh/homepage.html To order pubs for which a fee is charged, order from: Superintendent of Documents Government Printing Office Washington, DC 20402-9325 Ph: 202-512-1800 Fax: 202-512-2250
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) Department of Commerce Gaithersburg, MD 20899-0001 Ph: 301-975-4025 Fax: 301-926-1630 Order Publications From: Superintendent of Documents U.S. Government Printing Office (GPO) Washington, DC 20402 Ph: 202-512-1800 Fax: 202-512-2250 or National Technical Information Services (NTIS) 5285 Port Royal Rd. Springfield, VA 22161 Ph: 800-553-6847 Fax: 703-321-8547 Internet: http://ww.gov/ntis.gov	NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA) 900 Spring St. Silver Spring, MD 20910 Ph: 301-587-1400 Fax: 301-585-4219 Internet: www.nrmca.org
NATIONAL TERRAZZO & MOSAIC ASSOCIATION (NTMA) 110 East Market St., Suite 200 A Leesburg, Virginia 20176 Ph: 703-779-1022 or 800-323-9736 Fax: 703-779-1026 Internet: www.ntma.com e-mail: info@ntma.com	NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC) 1100 23rd Avenue Port Hueneme, CA 93043-4370 Ph: 805-982-4980 Internet: www.nfesc.navy.mil

NSF INTERNATIONAL (NSF) ATTN: Publications P.O. Box 130140 789 Dixboro Rd. Ann Arbor, MI 48113-0140 Ph: 734-769-8010 Fax: 734-769-0109 Toll Free: 800-NSF-MARK Internet: www.nsf.org	PIPE FABRICATION INSTITUTE (PFI) PMB 323 611 Pennsylvania Avenue, SE Washington, D.C. 20003 Ph: 514-634-3434 Fax: 514-634-9736 Internet: www.pfi-institute.org e-mail: pfi@pfi-institute.org
PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA) 800 Roosevelt Rd., Bldg C, Suite 20 Glen Ellyn, IL 60137 Ph: 630-858-6540 Fax: 630-790-3095	PLASTICS PIPE INSTITUTE (PPI) 1825 Connecticut Avenue NW Washington, D. C. 20009 Ph: 202-462-9607 Fax: 202-462-9779 Internet: www.plasticpipe.org
PLUMBING AND DRAINAGE INSTITUTE (PDI) 45 Bristol Dr., Suite 101. South Easton, MA 02375 Ph: 508-230-3516 Fax: 508-230-3529 Internet: www.pdionline.org e-mail: info@pdionline.org	PLUMBING AND PIPING INDUSTRY COUNCIL (PPIC) 9450 SW Commerce Circle, Suite 310 Wilsonville, OR 97070-9626 Ph: 503-682-7919 Fax: 213-487-3880
SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA) 4201 Lafayette Center Dr., Chantilly, VA 20151-1209 Ph: 703-803-2980 Fax: 703-803-3732 Internet: http://www.smacna.org	STEEL DOOR INSTITUTE (SDOI) 30200 Detroit Rd. Cleveland, OH 44145-1967 Ph: 440-899-0010 Fax: 440-892-1404 Internet: www.steeldoor.org
TILE COUNCIL OF AMERICA (TCA) 100 Clemson Research Blvd. Anderson, SC 29625 Ph: 864-646-8453 FAX: 864-646-2821 Internet: www.tileusa.com e-mail: literature@tileusa.com	UNDERWRITERS LABORATORIES (UL) 333 Pfingsten Rd. Northbrook, IL 60062-2096 Ph: 847-272-8800 Fax: 847-272-8129 Internet: http://www.ul.com/
UNI-BELL PVC PIPE ASSOCIATION (UBPPA) 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234 Ph: 214-243-3902 Fax: 214-243-3907 Internet: www.uni-bell.org	U. S. ARMY ENVIORNMENTAL HYGIENE AGENCY (USAEHA) Waste Disposal Engineering Division Aberdeen Proving Ground, MD 21010-5422 Ph: 410-671-3652

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA) Yeon Bldg. 522 SW 5th Ave. Portland, OR 97204-2122 Ph: 503-224-3930 Fax: 503-224-3934 Internet: www.wwpa.org	

END OF SECTION

SECTION 01300

SUBMITTALS

1 GENERAL

1.1 SUBMITTAL PROCEDURES

A. Provisions of this Section shall apply to those items specified in the Technical Sections under the paragraph entitled Submittals.

B. All submittals must be approved 15 calendar days prior to commencement of work or delivery of materials to the project site. Warranties, O&M manuals, test & balancing reports, and as-built drawings are to be submitted 10 calendar days prior to final inspection.

C. The Contractor shall furnish to the Contracting Officer, for his approval, four (4) prints of all shop drawings, product data, Materials Safety Data Sheets, and catalog cuts, of all equipment furnished under this Contract, prior to purchase, manufacture, or construction. These Drawings will be examined by the Contracting Officer and one (1) copy returned to the Contractor for correction, if necessary.

D. Itemized below is a list of materials requiring Drawings, certifications, manufacturer’s literature, data brochures, Materials Safety Data Sheets, technical data, and samples as noted shall be submitted to the Contracting Officer by the Contractor for approval using the appropriate form approved by the Contracting Officer.

E. Note that Materials Safety Data Sheets used on this project shall be submitted to the Contracting Officer. All submittals, except warranties and operating instructions, as noted below, shall be made not later than fifteen (15) days after receipt of the Notice to Proceed or as specified by the Contracting Officer.

F. The Contracting Officer will return the submittals approved or disapproved within ten (10) calendar days after receipt, by AF Form 3000.

G. Approval of submittals does not relieve the Contractor from performance in strict accordance with the Technical Provisions and Drawings, nor does such approval constitute "acceptance" under the provisions of this Contract. Warranties and operating instructions are required at the completion of the Contract work. Four (4) copies of all warranties and operating instructions shall be provided unless otherwise specified.

1.2 SUBMITTAL TYPE PROCEDURES

A. Commercial Warranties (W): Contractor shall furnish to the Contracting Officer prior to the Final Inspection, a listing of all manufacturer’s commercial warranties provided by those manufacturers on their materials and equipment that are components or sub-components of an equipment package, unit or fabrication. The Contractor shall furnish with each warranty the name, address, and telephone number of the warrantor’s representative
nearest to the location of the Contracting Officer. The representative shall honor the warranty during the warranty period and will provide the service prescribed in the terms of the warranty.

B. Test Results (TR) shall be provided within seven (7) calendar days after completion of the test and not less than seven (7) days prior to the last day of the Contract performance period.

C. Manufacturer’s Maintenance and Operating Instructions (MMO) shall be submitted, in triplicate, in bound hard-board binders prior to scheduling of the Final Inspection.

D. Record Drawings (RD) shall be submitted in duplicate Ten (10) days prior to request for Final Inspection.

1.3 SUBSTITUTIONS

A. Specific brand names mentioned shall establish standards of quality and performance. The phrase "or approved equal by the Contracting Officer" shall be implied unless otherwise noted as a sole source.

B. Substitute materials and equipment shall be equal in quality and performance to those specified. Any substitute materials and equipment installed without the approval of the Contracting Officer shall be removed and replaced with approved materials and equipment without cost to the Government.

C. A request for substitution shall be attached to AF Form 3000 and shall include complete data substantiating compliance with Contract requirements. The request submittal shall indicate the Contractor:

1. Has investigated the proposed product and determined that it meets or exceeds, in all respects, the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make other changes which may be required for the work to be completed at no additional cost to the Government (such as different surface preparation, size of connections/connectors, support system, or re-sizing of any interfacing systems).

4. Waives claims for additional cost which may be subsequently become apparent.

D. Substitution will not be considered when they are indicated or implied on shop drawings or product submittals without separate written request, or when acceptance will require revision of Contract Documents.

1.4 1.4 STANDARD OF TESTING LABORATORIES

A. Fire Ratings: When Specifications require proof that materials or products to be furnished conform to requirements of Underwriters Laboratory or Factory Mutual Laboratories (FM), in lieu of a UL or FM listing, a written certificate from an independent testing agency satisfactory to the Contracting Officer may be substituted. Furnish materials with labels attached. On site installation of labels is not permitted. No exceptions are allowed.

B. Certification: Certified tests on materials or equipment to be incorporated into this project will be acceptable provided they are conducted in accordance with standard established by the authority cited in referenced Specification, and the tested materials or equipment meet the specified requirements. Preprinted certification will not be acceptable. All certification shall be in the original. Certificates shall itemize the specified material or equipment tested, the Standard or other authority used in testing for the specified quality and the test method used. Attach certified copies of

all test reports of such certifications. Concrete Testing Laboratories shall be licensed in accordance with 780 CMR R1, dated 12/12/97. Concrete Testing Personnel shall be licensed in accordance with 780 CMR R1, dated 12/12/97. B. Certification: Certified tests on materials or equipment to be incorporated into this project will be acceptable provided they are conducted in accordance with standard established by the authority cited in referenced Specification, and the tested materials or equipment meet the specified requirements. Preprinted certification will not be acceptable. All certification shall be in the original. Certificates shall itemize the specified material or equipment tested, the Standard or other authority used in testing for the specified quality and the test method used. Attach certified copies of all test reports of such certifications. Concrete Testing Laboratories shall be licensed in accordance with 780 CMR R1, dated 12/12/97. Concrete Testing Personnel shall be licensed in accordance with 780 CMR R1, dated 12/12/97.

1.5 TYPES OF SUBMITTALS

A. Manufacturer’s Data (MD): Shall consist of Specifications, engineering data, and complete descriptive information of the specified item. MD shall
be provided by, and printed by, the manufacturer.

B. Manufacturer’s Installation Instructions (MII): Shall consist of data describing complete installation instructions of the specified item. MII shall be provided by, and printed by, the manufacturer.

C. Manufacturer’s Maintenance and Operations Instructions (MMO): Consists of complete operating instruction, test data or reports required, complete maintenance instruction including lubrication, inspection and adjustment requirements, bulletins with part numbers, instructions and descriptive information, and the name/address/telephone number of the warranty servicing organization.

D. Shop Drawings (SD): Shall provide all information required for accomplishment of shop work and shall include plans, elevations, sections, details, gauges, and finishes of the specified item. All shop drawings shall
be reviewed, approved, and stamped by a professional engineer registered in the State of Massachusetts.

E. Schedules (SCH): Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the project.

F. Samples (S): Samples shall consist of the actual manufacturer’s product. Samples shall illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work. Submit samples of finishes in colors selected, textures, and pattern for selection by the Contracting Officer. Include identification for each sample, with full project information. Reviewed samples may be used in the work area indicated in the individual Specification Sections.

G. Test Results (TR): Shall include the name of the testing authority, as statement that all sampling, testing, and reporting conforms to applicable technical specifications, and the signature of the individual representing the testing authority.

H. Record Drawings (RD): Shall consist of complete and accurately dimensioned plans, sections, and details of the finished facility.

I. Certification (CERT): Shall state that the specified item, system, or individual meets the requirements of the relevant Technical Specification Section. CERT’s shall be evidenced by the statement and signature of the authority so certifying.

J. Certificate of Compliance (COC): Shall be evidenced by a signed affidavit from the manufacturer indicating compliance with the applicable Technical Specification.

K. Plans (P): Shall describe a procedure for doing a specified sequence or operation of work and requires approval prior to starting the work.

L. Mix Design (MXD): A written formula or design of the specified mixture requiring approval prior to ordering or installation of the work.

M. Other: Submittal types may include, but are not limited to, Commercial Warranties and Notification Letters. See "Schedule of Submittals" and individual Technical Sections for special submittal requirements.

1.6 MATERIAL SAFETY DATA SHEETS (MSDS)

A. Submit MSDS for all paints, cleaners, solvents, thinners, and other potentially hazardous chemicals used on this project. Hazardous material is defined in the Code of Federal Regulations (CFR) 29 CFR 1910.1200.

B. MSDS shall be provided for material installed in the construction and material used at the construction site.

C. MSDS for items to be installed in the construction shall be attached to submittal data required by other Sections of this Specification.

1.7 ITEMS REQUIRING APPROVAL BEFORE DEMOLITION OF AFFECTED ITEMS

01010	P	Dust plan shall be approved before any specified work.	
08114		Custom Steel Doors and Frames:	Shop Drawings
08114		Custom Steel Doors and Frames:	Wiring Diagrams
08114		Custom Steel Doors and Frames:	Proof of Qualifications

1.8 SCHEDULE OF CONTRACTOR'S SUBMITTALS

ITEM NO.	SECTION	TYPE	ITEM
01	01010	SCH	Contractor's Schedule of Work Plan
02	01010	SCH	Schedule of Contractor Submittal (AF Form 66)
03	01010	P	Dust Control Plan
04	01010	NL	Request for Interruption
05	01010	RD	Daily Report to Inspector
06	01010	SCH	Components Scheduled for Enclosure
07	01010	Permit	Permit for Cutting, Welding & Soldering
08	01010	P	'C5' Aircraft fuselage drawings
09	01010	Other	439 AW Form 20, Contractor Information Sheet, MSDS Seets
10	01012	Other	Affirmative Procurement Reporting Form
11	01540	Other	Letter for Identification Badges
12	01572	Other	Construction Waste Management Plan
13	01572	Other	Waste Management Summary Form
14	02070	SCH	Schedule of selective demolition
15	05120	PD	Product Data
16	05120	SD	Shop Drawings

17	05120	CERT	Qualification Data
18	05120	TR	Mill Test Reports
19	05580	PD	Product Data
20	05580	SD	Shop Drawings
21	05580	S	Samples
22	08114	PD	Product Data
23	08114	CD	Coordination Drawings
24	08114	SD	Shop Drawings
25	08114	WD	Wiring Diagrams
26	08114	MD	Maintenance Data/Manuals
27	08114	MMO	Manufacturer Maintenance, Operations Instruction & Video Tape, Extended Warranties
28	08114	RD	Project Record Drawings
29	09900	PD	Product Data
30	09900	S	Samples of Finish-Coat Material
31	10425	PD	Product Data for Type of Sign
32	10425	SD	Shop Drawings of sign
33	16050	PD	Product Data
34	16050	SD	Shop Drawings
35	16050	S	Samples
36	16050	CERT	Welder Certificate
37	16100	PD	Product Data
38	16100	SD	Shop Drawings
39	16452	PD	Product Data
40	16452	CERT	Field-Test Organization Certificate
41	16452	TR	Test Results
42	16476	PD	Product Data
43	16476	WD	Wiring Diagram
44	16476	TR	Test Results
45	16476	MMO	Manufacturer Maintenance and Operations Instruction

--End of Section—

SECTION 01540

SECURITY

1 GENERAL

1.1 SUMMARY

All project work will take place in a Controlled or Restricted Area
(i.e., active aircraft runways, taxiways, pads, aprons). All work will be coordinated on a daily basis with Chief, Airfield Management, to allow normal aircraft operations and activities to continue during project.

1.2 SUBMITTALS

Letter, Identification Badges

2 PRODUCTS - N/A

3 EXECUTION

3.1 EXECUTION

3.1.1 The Contractor shall provide a gate guard at any point along the haul route(s) to control access to the work area. At the end of each workday, secure all entrances to the work area. Securing methods shall be approved by the Contracting Officer.

3.1.2 Restrict all activities and movement of workmen, supplies, and equipment to the designated project area and haul routes.

3.1.3 The Contractor shall enter the project site only at a location approved by the Contracting Officer. Location of daily work sites will be coordinated with Chief, Airfield Management, Building 7091, and each day, at a time not later then that approved by the Contracting Officer. The purpose is to maximize safety and security, as the Contractor will be working in the vicinity of active taxiways and other flight operations.

3.1.4 The Contractor shall comply with flightline driving procedures and restrictions in accordance with a briefing by Airfield Management. All Contractor personnel operating

vehicles or equipment on the airfield must be trained and familiar with required airfield driving policies. Subjects include obtaining clearance, proper tower communications, speed, traffic lanes, right of way and parking protocol, cleaning of tires prior to entering the flightline and other necessary information. The Contractor shall comply with flight line driving procedures and restrictions and shall be briefed by Airfield Management prior to commencing work on the airfield.

3.1.5 Contractor shall obtain vehicle & flight line passes from Airfield Management for all vehicles operating on the flight line.

3.2 IDENTIFICATION BADGES

3.2.1 Identifications Badges are required for projects on Westover ARB property and are to be obtained by submitting a letter to the Contracting Officer with the names of all the Contractor's employees including subcontractor personnel requiring badging. This listing shall show the project name and YTPM number, contract number, the full name, address, and social security number of all employees, and the Contractor's full address and telephone number.

3.2.2 Badges shall be worn at all times while on Base and shall be visible at all times.

3.2.3 Contractor shall be responsible for the return of all Identification Badges to the Contracting Officer after completion of the project. Final payment will not be made until all badges are returned.

3.3 SECURITY ESCORTS

The Government requires Contractor personnel including subcontractor personnel to be escorted by a Government representative while working in restricted areas of the Base.

3.4 RESTRICTIONS

The Contractor shall not allow cameras on the project site nor photographs to be taken without written permission of the Contracting Officer.

--End of Section--

SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 GENERAL

1.1 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.2 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.3 PLAN

A waste management plan shall be submitted within 15 days after contract award and prior to initiating any site preparation work. The plan shall include the following:

a. Name of individuals on the Contractor’s staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation.

c. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.

d. Characterization, including estimated types and quantities, of the waste to be generated.

e. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.

g. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.

h. Identification of materials that cannot be recycled/reused with an explanation or justification.

i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

j. The Contractor shall utilize the form Construction Waste Management Plan attached to the end of this section to prepare and submit this information.

1.4 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon

completion of the construction. See paragraph 1.7, Solid Waste Disposal and Recycling, below.

1.5 COLLECTION

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:

1.5.1 Source Separated Method.

Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.

1.5.2 Co-Mingled Method.

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

1.5.3 Other Methods.

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.6 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

1.6.1 Reuse.

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

1.6.2 Recycle.

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

1.6.3 Waste.

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator at the Contractor’s expense.

1.7 SOLID WASTE DISPOSAL AND RECYCLING

1.7.1 DOCUMENTATION

The Contractor shall record, document and report the total amount of construction/demolition debris and other solid waste that is generated and disposed of under this contract. The Contractor shall also record the total amount of debris and waste that has been recycled. The waste shall be recorded preferably by weight, but volume in cubic yards will also be acceptable. The Contractor will salvage and reuse the construction/demolition debris to the greatest extent possible. Waste materials that cannot be salvaged and/or reused and have value as being recyclable, shall be recycled. Only materials unable to be economically salvaged or recycled shall be transported to a landfill or incinerator. Revenues or other savings obtained for recycling or returns shall accrue to the Contractor. The records shall be made available to the Contracting Officer during construction and shall be submitted to the Contracting Officer prior to project closeout utilizing the Waste Management Summary Form also attached to end of this section.

CONSTRUCTION WASTE MANAGEMENT PLAN SUBMITTED BY _____
PROJECT #: YTPM 94-0101, REPAIR C-5 MAINTENANCE HANGAR DOORS DATE _____

I. Project waste analysis				
A. Types of Construction waste anticipated	Quantities & Options Available (tons)			
	Resale	Reuse	Recycle	Dispose
1.				
2.				
3.				
4.				

B. Projected Cost of Disposal	Total Quantity (Tons)	Total Disposal Cost ($)
(All trash with no salvage or recycling)		

II. Landfills and Incinerators to be used			
Name	Tipping Fee	Address	Telephone
1.			
2.			
3.			

III. SALVAGE PLAN (FOR RESALE, REUSE, OR RECYCLE)

A. List of Materials & Method of Reuse	Recycling Facility & Means of Transport
	1.
	2.
	3.
	4.

B. Cost to Salvage		Savings Resulting from Salvage			Net Cost/Savings
	Cost to Separate and Recycle	Reuse of Demo Materials	Revenues from Sale	Avoidance of Tipping Fees	(Savings – Costs)
1.					
2.					
3.					
4.					

IV. RECYCLING MANAGEMENT PLAN TO PROTECT RECYCLED MATERIALS FROM CONTAMINATION:

1. Provide containers and bins that are clearly and appropriately marked.
2. Prevent contamination of recyclable materials from incompatible products and materials.
3. Separate construction waste at the project site by one of the following methods: (check appropriate boxes)

- ❑ Source Separated Method: Waste products and materials, that are recyclable, are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash is transported to a landfill or incinerator.
- ❑ Co-Mingled Method: All construction waste is placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.
  - ❑ Other methods proposed by the Contractor and approved by the Contracting Officer.

WASTE MANAGEMENT SUMMARY FORM

I. PROJECT WASTE					**FROM (COMPANY):**	
QUANTITY (TONS)	LANDFILL SITE (# from Sect. II of Waste Mgt. Plan above)	TIP FEE/TON	TOTAL COST OF DISPOSAL, INCLUDING HAULING, CONTAINER RENTAL, TIP FEES	TOTAL COST/TON		
	1.				PROJECT #:	YTPM 94-0101
	2.				SUBMITTAL DATE:	
	3.				TIME PERIOD (Month/year or Total Project start date to end date):	

II. ALTERNATIVES TO LAND FILLING

TYPE OF MATERIAL	QUANTITY (TONS)	DESTINATION AND MEANS OF TRANSPORTATION (# From Section IV of Waste Management. Plan above)	COST TO HANDLE AND TRANSPORT ($)	REVENUE & TIP FEE EARNINGS ($)	NET COST ($)	COST IF LANDFILLED ($)	COMPARISON COST (+) OR SAVINGS (-) ($)
Cardboard							
Dimensional wood							
Beverage containers							
Land debris							
Concrete							
CMU							
Asphalt							
Metals - all types							
Gypsum board							
Paint							
Carpet							
Insulation							
Glass							
Cast stone							
Wood materials							
Electric cable							
PVC piping							
Rubber flooring							
Raised flooring							
Copper							
Plastics							

III. TOTAL NET COST (+) OR SAVINGS (-) from all alternatives to land filling all project waste **TOTAL**

--End of Section--

SECTION 01782

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of systems and equipment.

1.3 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 10 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. The Contracting Officer will return 1 copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Correct or modify each manual to comply with the Contracting Officer’s comments of the initial draft. Submit 3 copies of each corrected manual in final form within 10 days of receipt of the Contracting Officer’s.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in the operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents.

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title “OPERATION AND MAINTENANCE MANUAL,” Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on

each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft. white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Power failure.
3. System, subsystem, or equipment failure.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner’s operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Precautions against improper use.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer’s name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner’s operating personnel.

E. Manufacturers’ Data: Where manuals contain manufacturers’ standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers’ standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers’ printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

-- END OF SECTION—

SECTION 02070

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of existing steel framing around aperture openings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Summary of Work" for use of the building and phasing requirements.
2. Division 15 Sections for cutting, patching, or relocating mechanical items.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Government’s property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Government’s property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Government’s designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Government's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

B. Title to material and equipment to be demolished is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

B. Schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Government will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so that Government's operations will not be disrupted. Provide not less than 72 hours' notice to Government of activities that will affect Government's operations.

B. Government assumes no responsibility for actual condition of buildings to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.

C. Storage or sale of removed items or materials on-site will not be permitted.

1.8 SCHEDULING

A. Arrange selective demolition schedule so as not to interfere with Government's on-site operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

B. Utility Requirements: Refer to Division 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Government and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
2. Protect existing site improvements, and appurtenances to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.

3.4 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove structural framing members and lower to ground

by method suitable to avoid free fall and to prevent ground impact or dust generation.

7. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. The Contractor shall utilize the 439 SPTG/CEV Waste Disposal Manifest Form when disposing of material. The Contractor must comply with the requirements of Section 01012 pertaining to the recycling of construction/demolition debris and also the recording and reporting of the total amount of construction/demolition debris and other solid waste generated and either recycled or disposed of under this contract.

C. Disposal: Transport demolished materials off Government’s property and legally dispose of them.

3.6 CLEANING

A. Sweep the building broom-clean on completion of selective demolition operation.

-- End of Section --

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division, Specification Sections apply to this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SUMMARY

A. This Section includes structural steel, as specified herein, and includes, but is not limited to, the following:

1. Fabricate and install structural steel as required to create new aperture opening.
2. Fabricate and install miscellaneous structural steel as required by installation and operation of new aperture doors and its components.
3. Drill, cut, reinforce, and/or modify existing structural steel as required by installation and operation of new aperture doors and its components.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05580 "Sheet Metal Fabrication" for metal fabrications made from sheet metal."
2. Section 08114 "Custom Steel Doors and Frames" for aperture door and components.
3. Section 09900 "Painting" for surface preparation and paint requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer, registered in

the Commonwealth of Massachusetts, to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Indicate all design loads.
2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
5. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation. Shop Drawings shall be reviewed and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Shop primers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:

a. Category: Category I, conventional steel structures.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent. Professional Engineer shall be registered in the Commonwealth of Massachusetts.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As follows:

1. Carbon Steel: ASTM A 36 (ASTM A 36M).

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Weight Class: Extra strong.
2. Finish: Black.

E. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.

F. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

A. Primer: Fast-curing, lead and chromate free, Tnemec 10-99 or approved equal.

2.3 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of members transmitting loads in bearing.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by

burning. Drill holes in bearing plates.

2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.4 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

2.5 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces to be field welded.
2. Surfaces to be high-strength bolted with slip-critical connections.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:

1. SSPC-SP 2 "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply two coats of primer according to manufacturer's instructions and at the rate recommended to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.6 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

D. Splice members only where indicated.

E. Finish sections thermally cut during erection equal to a sheared appearance.

F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this

Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.5 FIELD QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor’s expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

F. Radiographic Inspection: ASTM E 94; minimum quality level "2-2T."

G. Ultrasonic Inspection: ASTM E 164.

3.6 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Section 09900 "Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

C. Removal of Debris: At the end of each day, remove all debris to proper storage or disposal area.

-- End of Section --

SECTION 05580

SHEET METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division, Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Closures and trim.
2. Filler panels.
3. Sheathing panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05120 "Structural Steel."
2. Section 08114 "Custom Steel Doors"
3. Section 09900 "Painting."

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, and fabricate panels so that, when installed, they are capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials, including anchors and connections, and without exhibiting permanent deformation in any of the components making up panels:

1. 45 psf wind load.

B. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for each type of product specified.

C. Shop drawings detailing fabrication and installation of sheet metal fabrications. Include plans, elevations, sections, details of components, and attachments to other units of Work. Indicate jointing, fasteners, anchorage, accessory items, and finishes. Shop drawings shall be reviewed and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

1. For installed sheet metal fabrications indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Coordination drawings for sheet metal fabrications housing items specified under other sections of these Specifications.

E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors, textures, and patterns available for each type of sheet metal fabrication indicated.

F. Samples for verification of each metal finish indicated, prepared on a 6-inch- square sample of metal of same thickness and composition indicated for final unit of Work. Where finishes involves normal color and texture variations, include sample sets composed of 2 or more units showing the full range of variations expected.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing sheet metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Single-Source Responsibility: Obtain sheet metal fabrications from a single manufacturer.

C. Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of assemblies similar to this Project in material, design, and extent and that have a record of successful in-service performance. Professional Engineer shall be registered in the Commonwealth of Massachusetts.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal fabrications as factory-assembled units with protective crating and covering. Remove protective covering before it stains or bonds to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Where sheet metal fabrications are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. American Steel Products Corp.
2. Brandt-Airflex Corp.
3. Crescent Metal Products, Inc.
4. Custom Enclosures, Inc.
5. Dec Associates.
6. EH Gustafson & Co.
7. Metal Sales & Service, Inc.
8. Milgo/Bufkin.
9. Soheil Mosun Ltd.
10. Superior Fireproof Door, Inc.
11. Universal Molding Co.
12. Zephyr Architectural Metals, Inc.
Or Approved Equal.

2.2 SHEET METAL

A. General: Provide sheet metal selected for surface flatness, smoothness, and freedom from surface blemishes where exposed to view in the finished unit. Do not use materials with pitting, seam marks, roller marks, variations in flatness exceeding those permitted by

referenced standards for stretcher-leveled metal sheet, stains, discoloration, or other imperfections.

B. Steel Sheet: Commercial-quality, cold-rolled, stretcher-leveled, carbon-steel sheet, complying with the following requirements:

1. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A, 591/M with Class C zinc coating; chemically treated in mill with phosphate solution and light chromate rinse.

C. Aluminum Sheet: Alloy and temper recommended by manufacturer for intended use and suitable for application of finish indicated, but with not less than the strength and durability properties specified in ASTM B 209 (ASTM B 209M) for 5005-H15.

2.3 MISCELLANEOUS MATERIALS

A. Sound-Deadening Insulation: Unfaced, mineral-fiber blanket or batt insulation complying with ASTM C 665 for Type I and passing ASTM E 136 test.

B. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for strength and compatibility in the fabricated items.

C. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with metals joined.

1. Provide concealed fasteners for interconnection of sheet metal fabrications and for attaching them to other work except where exposed fasteners are unavoidable or are the standard fastening method.
2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Nonstructural Anchors: For applications not indicated to comply with design loadings, provide anchors of type, size, and material required for type of loading and installation indicated, as recommended by the manufacturer from options listed below, unless otherwise indicated. Use nonferrous metal or hot-dip galvanized anchors for exterior installations and elsewhere as required for corrosion resistance.

1. Powder-actuated fasteners.

E. Flexible Cellular Neoprene Gaskets: ASTM D 1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain airtight seal for application indicated.

F. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

G. Joint Sealants for Concealed Joints: Butyl sealant complying with Section 07901 "Joint Sealants."

2.4 FABRICATION, GENERAL

A. General: Fabricate sheet metal to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Coordinate dimensions and attachment methods of sheet metal fabrications with those of adjoining products and construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned with one another in the relationship indicated.

C. Increase metal thickness or reinforce metal with concealed stiffeners, backing materials, or both, as required to produce surfaces whose variations in flatness do not exceed those permitted by referenced standards for stretcher-leveled metal sheet and to impart sufficient strength for indicated use.

1. Support joints with concealed stiffeners as required to hold exposed faces of adjoining sheets in flush alignment.
2. Fill space between stiffeners with sound-deadening insulation attached to face sheet with cold-applied asphalt mastic, unless otherwise indicated.

D. Assemble sheet metal fabrications in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

E. Form sheet metal fabrications to profiles indicated in maximum lengths to minimize joints and without exposed cut edges. Fold back exposed ends of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease exposed edges with backing to a radius of approximately 1/32 inch. Produce flat, flush surfaces without cracking or grain separation at bends.

F. Continuously weld joints and seams, except where other methods of joining are indicated. Grind, fill, and dress welds to produce smooth flush exposed surfaces in which welds are not visible after final finishing is completed.

G. Build in straps, plates, and brackets as required for supporting and anchoring fabricated items to adjoining construction. Reinforce sheet metal units as required to attach and support other construction.

2.5 CLOSURES AND TRIM

A. Form closures and trim members from sheet metal of type and thickness indicated below. Fabricate closures and trim to tightly close with adjoining construction.

1. Metal for Exterior Installations: Galvanized-steel sheet, 1.3 mm, with weathertight joints at exterior installations.

B. Conceal fasteners where possible; otherwise, locate where they will be as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.

C. Drill and tap holes required for securing closures and trim to other surfaces.

D. Incorporate gaskets where indicated or required for concealed, continuous seal at abutting surfaces.

E. Miter or cope trim members at corners to form tight joints.

2.6 FILLER PANELS

A. Form filler panels for closing ends of partition systems and for other applications indicated from sheet metal of type and thickness indicated. Incorporate reveals, trim, and concealed anchorages for attachment to adjacent surfaces.

1. Galvanized-steel sheet, 1.6 mm.

B. Attach gaskets to all edges of panels that abut adjacent surfaces to form a continuous seal. Use compressible gaskets or mastic sealing tape, applied to center of panel edges to be concealed from view, unless otherwise indicated.

2.7 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations on applying and designating finishes.

B. Complete mechanical finishes of flat sheet metal surfaces before fabrication wherever possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary, protective covering prior to shipment.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.7 mil or thicker) complying with AAMA 607.1.

2.9 GALVANIZED-STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, grease, or other contaminants followed by a conversion coating of type suited to organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately following cleaning and pre-treatment.

1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.10 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pre-treatment: Immediately following surface preparation, apply a conversion coating of the type suited to coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately following surface preparation and pre-treatment.

1. Shop Primer for Ferrous Metal: Fast-curing, lead and chromate free, Tnemec 10-99 or approved equal system, good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages and setting drawings, diagrams, templates, instructions, and directions for installing items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project site.

3.2 INSTALLATION

A. Locate and place sheet metal fabrications plumb, level, and in alignment with adjacent construction.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect sheet metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, insulation, and

flashings as the work progresses to make work weatherproof, soundproof, or lightproof as required.

E. Corrosion Protection: Coat concealed surfaces of aluminum, zinc-coated, and nonferrous metals that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 ADJUSTING

A. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

3.4 PROTECTION

A. Protect finishes of sheet metal fabrications from damage during construction period. Remove temporary protective coverings at the time of Substantial Completion.

-- End of Section --

SECTION 08114

CUSTOM STEEL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1, Specification Sections apply to this Section.

1.2 SUMMARY

A. The scope of work specified herein includes, but is not limited to, the following:

1. Design, fabrication, assembly, installation, test, and adjust custom aperture doors and their operating components.
2. Modification to existing hangar doors as required by new aperture door and its operating components.
3. Operating instructions, demonstration, training and videotaping.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05120 "Structural Steel" for aperture opening framing.
2. Section 05580 "Sheet Metal Fabrication" for custom metal work.
3. Section 09900 "Painting" for Paint Specifications.
4. Section 10425 "Signs" for instructional and operational signage.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer aperture door, aperture opening and operating component required by Contract Documents to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, shop drawings, and other structural data as it pertains to the design and operations of the aperture door and its components.

C. Functional Performance: Design, fabricate, install and test aperture door system with form fitting foam collar system for "fit" (weather tight seal) with ’C5’ aircraft in place at; minimum jacking height at 13 degree, 30 minutes of hangar centerline and at maximum jacked height at 13 degrees, 30 minutes off hangar centerline as shown on drawings.

D. Maneuveral Performance: Design, fabricate, install and test aperture door system which provide horizontal and vertical movement as required to accomplish functional performance requirements.

E. Dimensional Performance: Provide maximum clearance (8" minimum) between aircraft and any fixed object (aperture opening). Provide continuous pressure sensitive limit switches between aircraft and aperture door system.

F. Procedural Performance: Design, fabricate, install and test custom aperture door systems and its components which operates according to the following procedures. Each hangar door leaf, each aperture door leaf, and each closure door leaf shall operate independently according to the following procedures:

1. Turn power on at controllers.
2. Controllers and sensors shall indicate presence of aircraft and its position height within path of hangar door.
3. Controller and sensors allows and/or prohibits movement of hangar door, closure door and aperture door until all components are positioned for required clearance around aircraft.
4. Closure doors and aperture doors are repositioned as required for clearance around aircraft.
5. When controller and sensors indicate clearances, main hangar doors move to closed position.
6. Controller repositions aperture doors to closed position (weather tight seal around aircraft). Controller, sensors and pressure switches allow and/or restrict movement of aperture door according to clearance requirements.
7. Controller repositions closure doors to position abutting aircraft fuselage. Controller and pressure switches allow and restrict movement of closure door according to clearance requirements.
8. Controller, sensors, and pressure sensitive switches shall continuously monitor aircraft’s position while aircraft is within hangar door path.
9. Aperture doors system shall be counter balance so as

to allow the doors to float/move with the aircraft's movement once the controller's motor power is off.

10 Controller shall operate the retraction (opening) of closure doors, aperture doors and hangar door leafs as required for removing the aircraft from the hangar.

G. Operational Performance: Design, fabricate, install and test door operators as required to accomplish the maneuver performance requirements. Operators shall be electrically controlled, with manual operations in the event of power failure. Controllers shall interface all moveable components (hangar doors, closure doors and aperture doors) with sequencing and over rides required to operate all doors according to procedural performance requirements.

1.4 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product Data including manufacturer's specifications for fabrication and installation. Provide data substantiating that products comply with requirements and for the following:

1. Data on operators, hardware, and accessories.
2. Roughing-in diagrams.
3. Parts lists.

C. Shop Drawings: Detailing fabrication of aperture door and all operating components:

1. Indicate compliance with structural, functional, maneuveral, dimensional, procedural and operational performances required.
2. Indicate all design loads.
3. Include shop drawings signed and sealed by a qualified Professional Engineer responsible for their preparation. Shop drawings shall be reviewed and stamped by a professional engineer registered in the Commonwealth of Massachusetts.
4. Include details, type, sizes, and all specifications for all motors, tracks, cables, pulleys, counterweights, etc. required by the operations of the doors.
5. Cross sectional drawing of C-5 aircraft fuselage at

station 2300 cut at 13 deg. 30 min. to the left of A/C centerline.

D. Wiring Diagrams: Detailing wiring for power operator, signal, photocells, and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Wiring diagrams shall include a table indicating operating procedures and sequences.

E. Maintenance Data: Submit manufacturer's maintenance and service data for door operators and control system, including the name, address, and telephone number of the nearest authorized service representative.

F. Operating instructions, demonstration, training and videotaping: The contractor shall provide training sessions for all personnel who are required to operate the door system. The sessions shall provide all necessary printed information, demonstration and hands-on experience to properly operate the doors. All sessions shall be video taped and two (2) copies submitted to the Government for future training.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm experienced (at least five (5) similar installations) in manufacturing custom aperture hangar doors similar to those indicated for this Project and that have a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work. The Contractor shall provide names, locations, contacts, and dates as proof of experience.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings.

B. Field Verifications: Check and verify all existing conditions prior to proceeding with any work required by this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and operating components paletted, wrapped, or crated to provide protection during transit and job storage.

B. Inspect doors and operating components on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to the Contracting Officer; otherwise, remove and replace damaged items as directed.

C. Store doors and operating components at building site under cover. Place units on minimum 4-inch high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames by one of the following or equal approved by the Contracting Officer:

1. Fleming Steel Co., New Castle, PA.
2. AeroSystems Corp./Rolling Door, Oklahoma City, OK.
3. International Door, Inc., Canton, MI.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strips: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A1011 (ASTM A1011M), free of scale, pitting, or surface defects.

B. Cold-Rolled Steel Sheets: Commercial-quality, level, carbon steel, complying with ASTM A1008.

C. Galvanized Steel Sheets: Zinc-coated carbon-steel sheets of commercial quality, complying with ASTM A 526 (ASTM A526M) and ASTM A 525 with A 60 or G 60 (ASTM A525M with Z 180 or ZF 180) coating designation, mill phosphatized.

D. Steel Pipe: ASTM A53.

E. Structural Steel Shapes, Plates, and Bars: Carbon steel: ASTM A 36.

F. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type I.

G. Welding Electrodes: Comply with AWS requirement.

H. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000.

I. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of polypropylene or nylon woven pile.

J. Door Core Material: Expanded polystyrene.

2.3 DOORS

A. General: Provide custom steel aperture door in compliance performance requirements indicated.

2.4 DOOR OPERATORS

A. General:

1. Provide electric door operator assembly, complete with electric motors and factory pre-wired motor controls, gear-reduction units, solenoid-operated brake, clutch, remote control stations, and control devices. Operators shall be sized as recommended by the manufacturer for door size, weight and movement; for condition of exposure; and for long-term, maintenance-free operation under normal use load for the type of operations indicated.

B. Emergency Operation: Locate and provide for manual operation that requires less than 20 lbs. of force to operate the door when power is off.

2.5 DOOR CONTROLS

A. Photocell Control System: Provide the manufacturer's standard horizontal beam photocell control system, arranged as indicated. Photocell control system shall be not less than industrial grade quality.

B. Electrical Interlocks: Provide electrical interlocks to prevent operation of the unit when operation of the door is prohibited by photocells, pressure sensors, or other control switches. Electrical interlocks shall be not less than industrial grade quality.

C. Automatic Reversing Control: Furnish each door with automatic safety switch, extending full circumference of door opening and located within neoprene weatherstripping. Contact with switch will immediately

stop the door travel. Automatic reversing controls shall be not less than industrial grade quality.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Provide manufacturer's standard track system, sized for door size and weight and designed for clearances shown. Provide complete track assembly, including brackets, bracing, and reinforcing for rigid support required by door type and size.

2.7 COUNTERBALANCING MECHANISM: Provide manufacturer's standard counterbalancing mechanism sized for door size, weight, and required movement as indicated on the Drawings.

2.8 FABRICATION

A. General: Fabricate door system components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

B. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides.

C. Reinforce the work as necessary for the performance requirements and for support to the structure.

D. Dissimilar Metals: Separate dissimilar metals with bituminous paint, a suitable sealant, non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.

E. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.

F. Fasteners: Conceal fasteners wherever possible.

G. Weatherstripping: Provide compression weatherstripping as indicated.

2.9 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Shop Painting: Clean, treat, and paint exposed surfaces

of steel doors and components, including galvanized surfaces:

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before applying paint.
2. Apply pretreatment to cleaned metal surfaces; use cold phosphate solution (SSPC-PT 2), hot phosphate solution (SSPC-PT 4), or basic zinc chromate-vinyl butyral wash primer (SSPC-Paint 27).
3. Apply shop coat of prime paint with time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply baked-on or air-dried primer immediately after cleaning and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Provide door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer’s instructions, and as specified.

1. Fasten vertical track assembly to framing at not less than 24 in. o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door-operating equipment.

B. Provide complete door operator system in accordance with manufacturer’s instructions, including piping, controls, control wiring, and remote power units.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

C. Factory Finish Touchup: Immediately after erection, sand to feather-edge minor scratches, chipped, or damaged areas and apply touchup of compatible air-drying paint. Minor finish imperfections may be repaired provided finish matches new work finish and is acceptable to the Contracting Officer; otherwise, remove and replace.

-- End of Section --

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Contracting Officer will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

D. Related Sections include the following:

1. Section 05120 "Structural Steel" for shop priming structural steel.
2. Section 05580 "Sheet Metal Fabrications" for shop priming ferrous metal.
3. Section 08114 "Custom Steel Doors" for shop priming steel doors and frames.

4. Section 10425 "Signs."

1.3 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. Ferrous Metal: Provide two 4-inch square samples of flat metal and two 8-inch long samples of solid metal for each color and finish.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder

type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

A. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

B. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Government.

1. Quantity: Furnish the Government with an additional 5 percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are selected to establish a standard of quality of the coatings to be used in the work. Those qualities include performance and durability. Other manufacturers will be considered as an “or equal” against these standards.

1. Tnemec
2. Pittsburgh
3. Sherwin Williams
4. Glidden
5. Pratt and Lambert

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

2.3 PAINT PRODUCTS

A. Primer: Two coats of chemically active, rust-inhibitive modified alkyd primer, Tnemec Series 10-99, or approved equal.

B. Finish Coat: Two coats of industrial enamel, Tnemec Series 2H Hi-Build Tneme-Gloss, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

2. Start of painting will be construed as the Applicator’s acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Contracting Officer about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer’s written instructions for each particular substrate condition and as specified.

1. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council’s (SSPC) recommendations.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
2. Provide finish coats that are compatible with primers used.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer’s recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by the Contracting Officer.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

3.6 PAINT SCHEDULE

A. Finish paint color to match existing color.

-- End of Section --

SECTION 10425

SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of signs:

1. Panel signs.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 08114 "Custom Steel Doors."

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and lettering layout.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Manufacturers of Panel Signs:

a. ABC Architectural Signing System.
b. Allenite.
c. Andco Industries Corp.
d. APCO Graphics, Inc.
e. ASI Sign Systems, Inc.
f. Best Manufacturing Company.
g. Charleston Industries, Inc.
h. DGS Corp.
i. Diskey Sign Corp.
j. Environmental Graphic Systems, Inc.
k. Modulex.
l. Mohawk Sign Systems.
m. Poblocki & Sons, Inc.
n. Spanjer Brothers, Inc.
o. The Supersine Company.
p. Vomar Products, Inc.
Or Approved Equal.

2.2 MATERIALS

A. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the

strength and durability properties specified in ASTM B 209 for 5005-H15.

B. Vinyl Film: Provide opaque reflective vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.

C. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Square cut.
2. Corner Condition: Corners rounded to radius indicated.

C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Contracting Officer from the manufacturer’s standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum

Association for designating aluminum finishes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.

1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in predrilled holes filled with quick-setting cement.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Government.

-- End of Section --

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

1. Submittals.
2. Coordination drawings.
3. Record documents.
4. Maintenance manuals.
5. Rough-ins.
6. Electrical installations.
7. Cutting and patching.
8. Energy efficient motors.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section "Electrical Requirements for Mechanical Equipment," for factory-installed motors, controllers, accessories, and connections.
2. Section 16050 "Basic Electrical Materials and Methods," for materials and methods common to the remainder of Division 16.

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Include shop drawings signed and sealed by a qualified Professional Electrical Engineer responsible for their preparation. Shop drawings shall be reviewed and stamped by a Professional Electrical Engineer registered in the Commonwealth of Massachusetts. Submit the following quantities of electrical related shop drawings, product

data, and samples to allow for required distribution.

1. Shop Drawings: Four (4) copies.
2. Product Data: (printed) four (4) copies.
3. Samples: One (1) copy.

C. Additional copies may be required by individual sections of these Specifications.

1.4 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.5 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1. Provide six (6) copies upon completion of project. In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer’s printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Parts manual and/or catalog indicating available parts and components and method of ordering.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with

names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS

A. All new motors shall have efficiency ratings as per Engineering Technical Letter (ETL) 95-4.

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data to greatest extent

possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Contracting Officer.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1. In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

    a. Uncover Work to provide for installation of ill-timed Work.
    b. Remove and replace defective Work.
    c. Remove and replace Work not conforming to requirements of the Contract Documents.
    d. Remove samples of installed Work as specified for testing.
    e. Install equipment and materials in existing structures.
    f. Upon written instructions from the Contracting Officer, uncover and restore Work to provide for Contracting Officer observation of concealed Work.

2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
7. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

    a. Refer to Division 1 for definition of experienced "Installer."

-- End of Section --

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

B. Requirements specified in Section 16010 "Basic Electrical Requirements" apply to this Section.

1.2 SUMMARY

A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:

1. Selective demolition including:

    a. Nondestructive removal of materials and equipment for reuse or salvage as indicated.
    b. Dismantling electrical materials and equipment made obsolete by these installations.

2. Miscellaneous metals for support of electrical materials and equipment.
3. Wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment.
4. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.
5. Access panels and doors in walls, ceilings, and floors for access to electrical materials and equipment.

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for the following products:

1. Access panels and doors.
2. Joint sealers.

C. Samples of joint sealer, consisting of strips of actual products showing full range of colors available for each product.

D. Welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer for the installation and application joint sealers, access panels, and doors.

B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

1. Provide UL Label on each fire-rated access door.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver joint sealer materials in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle joint sealer materials in compliance with the manufacturers' recommendations to prevent their deterioration and damage.

1.6 PROJECT CONDITIONS

A. Conditions Affecting Selective Demolition: The following project conditions apply:

1. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
2. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

B. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do no apply joint sealers to wet substrates.

1.7 SEQUENCE AND SCHEDULING

A. Coordinate the shut-off and disconnection of electrical service with the Government and the utility company.

B. Perform demolition in phases as indicated.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.

F. Fasteners: Zinc-coated, type, grade, and class as required.

2.2 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

B. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire- rated walls and floors. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Dow Corning Fire Stop Foam," Dow Corning Corp.
b. "Pensil 851," General Electric Co.
Or Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape.

Remove tape immediately after tooling without disturbing joint seal.

3.3 SELECTIVE DEMOLITION

A. General: Demolish, remove, demount, and disconnect abandoned electrical materials and equipment indicated to be removed and not indicated to be salvaged or saved.

B. Materials and Equipment To Be Salvaged: Remove, demount, and disconnect existing electrical materials and equipment indicated to be removed and salvaged, and deliver materials and equipment to the location designated for storage.

C. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment not indicated to be salvaged.

D. Electrical Materials and Equipment: Demolish, remove, demount, and disconnect the following items:

1. Inactive and obsolete raceway systems, controls, and fixtures.

a. Raceways embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations. Remove materials above accessible ceilings.

2. Perform cutting and patching required for demolition in accordance with Division 1.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.5 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Comply with recommendations of ASTM C1193 for use of elastomeric joint sealants.
2. Comply with recommendations of ASTM C1193 for use of

acrylic- emulsion joint sealants.

B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

C. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

-- End of Section --

SECTION 16100

RACEWAYS, BOXES, AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Raceways include the following:

1. Rigid metal conduit.
2. Intermediate metal conduit.
3. Polyvinyl chloride (PVC) externally coated rigid steel conduit.
4. PVC externally coated intermediate metal conduit.
5. Electrical metallic tubing (EMT).
6. Flexible metal conduit.
7. Liquidtight flexible conduit.
8. Rigid nonmetallic conduit.
9. Electrical nonmetallic tubing (ENT).
10. Wireway.
11. Surface raceways.

C. Boxes, enclosures, and cabinets include the following:

1. Device boxes.
2. Floor boxes.
3. Outlet boxes.
4. Pull and junction boxes.
5. Cabinets and hinged cover enclosures.

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

A. Product data for surface raceway, wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.

B. Shop drawings for nonstandard boxes, enclosures, and cabinets. Include layout drawings showing components and wiring.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation. All requirements of Article 513 - Aircraft Hangars, shall apply.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Comply with NECA "Standard of Installation."

D. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, furnish and install products equal to the quality and rating of manufacturers listed:

1. Metal Conduit and Tubing:

a. Monogram Co., AFC.
b. Alflex Corp.
c. Allied Tube and Conduit, Grinnell Co.
d. Anamet, Inc., Anaconda Metal Hose.
e. Anixter Brothers, Inc.
f. Carol Cable Co., Inc.
g. Cole-Flex Corp.
h. Flexcon, Inc., Coleman Cable Systems, Inc.
i. Spiraduct, Inc.
j. Triangle PWC, Inc.
k. Wheatland Tube Co.
Or Approved Equal.

2. Conduit Bodies and Fittings:

a. Scott Fetzer Company, Adalet-PLM.
b. American Electric, Construction Materials Group.
c. Emerson Electric Co., Appleton Electric Co.
d. Carlon.
e. Hubbell, Inc., Killark Electric Manufacturing Co.
f. General Signal, O-Z/Gedney Unit.
g. Spring City Electrical Manufacturing Co.
Or Approved Equal.

3. Boxes:

a. Scott Fetzer Company, Adalet-PLM.
b. Butler Manufacturing Co., Walker Division.
c. Cooper Industries, Midwest Electric.
d. Electric Panelboard Co., Inc.
e. Erickson Electrical Equipment Co.
f. American Electric, FL Industries.
g. Hoffman Engineering Co., Federal-Hoffman, Inc.
h. Hubbell Inc., Killark Electric Manufacturing Co.
i. General Signal, O-Z/Gedney.
j. Parker Electrical Manufacturing Co.
k. Raco, Inc., Hubbell Inc.
l. Robroy Industries, Inc., Electrical Division.
m. Spring City Electrical Manufacturing Co.
n. Square D Co.
o. Thomas & Betts Corp.
p. Woodhead Industries, Inc., Daniel Woodhead Co.
Or Approved Equal.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit: ANSI C80.6.

C. Flexible Metal Conduit: Zinc-coated steel.

D. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

E. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

2.3 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.
2. Damp or Wet Locations: Rigid steel conduit.
3. Exposed: intermediate metal conduit.
4. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways and boxes as indicated, according to manufacturer’s written instructions.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

C. Install raceways level and square and at proper elevations. Provide adequate headroom.

D. Complete raceway installation before starting conductor installation.

E. Support raceway as specified in Section "Supporting Devices."

F. Use temporary closures to prevent foreign matter from entering raceway.

G. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

H. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit,

use threaded rigid steel conduit fittings, except as otherwise indicated.

I. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

K. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

L. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

N. Install raceway sealing fittings according to the manufacturer’s written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.
2. Where conduits pass building interior to building

exterior.
3. Where otherwise required by the NEC.

O. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

P. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.5 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16100

SECTION 16120

WIRES AND CABLES

1.1 PROJECT INCLUDES

A. Wires, cables, and connectors for power, signal, control and related systems rated 600 volts and less.

1.2 QUALITY ASSURANCE

A. Compliance: National Electrical Code; UL 4, 83, 486A, 486B, 854; NEMA/ICEA WC-70, WC-71, WC-74; IEEE 82. All requirements of National Electrical Code, Article 513 - Aircraft Hangars, shall apply.

1.3 PRODUCTS

A. Wire Components:

1. Conductors for Power Circuits: Solid conductors for No. 10 AWG and smaller; stranded conductors for No. 8 AWG and larger.
2. Conductor Material: Copper.
3. Insulation: THHN/THWN for conductors size 500MCM and larger and No. 8 AWG and smaller; THW, THHN/THWN or XHHW insulation for other sizes based on location.
4. Jackets: Factory-applied nylon or PVC.

-- End of Section --

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

B. Requirements of the following Sections apply to this Section:

1. Section 16010 "Basic Electrical Requirements."
2. Section 16050 "Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:

1. Buried electrical line warnings.
2. Identification labeling for raceways, cables, and conductors.
3. Operational instruction signs.
4. Warning and caution signs.
5. Equipment labels and signs.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 09900 "Painting" for related identification requirements.
2. Section 16120 "Wires and Cables" for requirements for color coding of conductors for phase identification.

C. Refer to other Division 16 Sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code." All requirements of National Electrical Code, Article 513 - Aircraft Hangars, shall

apply.

B. ANSI Compliance: Comply with requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems," with regard to type and size of lettering for raceway and cable labels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. American Labelmark Co.
2. Calpico, Inc.
3. Cole-Flex Corp.
4. Emed Co., Inc.
5. George-Ingraham Corp.
6. Ideal Industries, Inc.
7. Kraftbilt
8. LEM Products, Inc.
9. Markal Corp.
10. National Band and Tag Co.
11. Panduit Corp.
12. Radar Engineers Div., EPIC Corp.
13. Seton Name Plate Co.
14. Standard Signs, Inc.
15. W.H.Brady, Co.
Or Approved Equal.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Adhesive Marking Labels for Raceway and Metal-clad Cable: Preprinted, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Lighting, Power, Light, Power d.c., Air Conditioning, Communications, Control, Fire).

B. Label Size: as follows:

1. Raceways 1-Inch and Smaller: 1-1/8 inches high by 4 inches long.
2. Raceways Larger than 1-Inch: 1-1/8 inches high by 8 inches long.

C. Color: Black legend on orange background.

D. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

E. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pretensioned gripping action when coiled around the raceway or cable.

F. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

G. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.

H. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014- inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

I. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with Eyelet for fastener.

J. Aluminum-Faced Card Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inches thick, and laminated with moisture-resistant acrylic adhesive. Pre-print legend to suit the application, and punch for tie fastener.

K. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 inches by 2 inches by 19 gage.

L. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners.

M. Baked-Enamel Warning and Caution Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

N. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.

O. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

P. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self- locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 deg F to 350 deg F. Provide ties in specified colors when used for color coding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Install identification devices in accordance with manufacturer’s written instructions and requirements of NEC.

C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

D. Conduit Identification:

E. Identify high-voltage feeder conduits (over 600 V) by words "DANGER-HIGH VOLTAGE" in black letters 2 inches high, stenciled at 10-foot intervals over continuous painted orange background.

1. The following areas shall be identified:

a. On entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
b. On wall surfaces directly external to conduits run

concealed within wall.
c. On all accessible surfaces of concrete envelope around conduits in vertical shafts, exposed at ceilings or concealed above suspended ceilings.
d. On entire surface of exposed conduits.

2. Apply identification to areas as follows:

a. Clean surface of dust, loose material, and oily films before painting.
b. Prime surfaces: For galvanized metal, use single-component acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use heavy-duty acrylic resin block filler. For concrete surfaces, use clear alkali-resistant alkyd binder-type sealer.
c. Apply one intermediate and one finish coat of orange silicone alkyd enamel.
d. Apply primer and finish materials in accordance with manufacturer’s instructions.

F. Identify Raceways of Certain Systems with Color Banding: Band exposed or accessible raceways of the following systems for identification. Bands shall be pretensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs. Apply the following colors:

1. Fire Alarm System: Red
2. Fire Suppression Supervisory and Control System: Red and Yellow
3. Combined Fire Alarm and Watchmen’s Report System: Red and Blue
4. Watchmen’s Report System: Blue
5. Security System: Blue and Yellow
6. Civil Defense System: Yellow
7. Clock System: Green
8. Mechanical and Electrical Supervisory System: Green and Blue
9. Telephone System: Green and Yellow

G. Identify Junction, Pull, and Connection Boxes: Code-required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers

with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

H. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

I. Limit use of line markers to direct-burial cables.

J. Install line marker for underground wiring, both direct-buried and in raceway.

K. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Yellow
Red	B	Brown
Blue	C	Orange
White	Neutral	White
Green	Ground	Green

L. Use conductors with color factory-applied the entire length of the conductors except as follows:

1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.

   a. Apply colored, pressure-sensitive plastic tape in half- lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.

   b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each

terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

M. Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb test monofilament line or one-piece self-locking nylon cable ties.

N. Tag or label conductors as follows:

1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility’s electrical installations.

O. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic- laminated instruction signs with approved legend where instructions or explanations are needed for system or

equipment operation. Install butyrate signs with metal backing for outdoor items.

2. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

P. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.

   a. Panelboards, electrical cabinets, and enclosures.
   b. Access doors and panels for concealed electrical items.
   c. Electrical switchgear and switchboards.
   d. Electrical substations.
   e. Motor control centers.
   f. Motor starters.
   g. Pushbutton stations.
   h. Power transfer equipment.
   i. Contactors.
   j. Remote-controlled switches.
   k. Control devices.
   l. Transformers.
   m. Fire alarm master station or control panel.
   n. Security monitoring master station or control panel.

Q. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items

controlled by each individual breaker.

R. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

-- End of Section --

SECTION 16452

GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

B. Requirements of the following Sections apply to this Section:

1. Section 16010 "Basic Electrical Requirements."
2. Section 16050 "Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

B. Related Sections: The following Sections contains requirements that relate to this Section:

1. Section 16120 "Wires and Cables."

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for ground rods, connectors and connection materials, and grounding fittings.

C. Field-testing organization certificate, signed by the Contractor, certifying that the organization performing field tests complies with the requirements specified in Quality Assurance below.

D. Report of field tests and observations certified by the testing organization.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

1. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

B. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.

C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC). All requirements of National Electrical Code, Article 513 - Aircraft Hangars, shall apply.

D. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Anixter Bros., Inc.
2. Bashlin Industries, Inc.
3. Buckingham Mfg. Co.
4. A.B. Chance Co.
5. Dossert Corp.
6. Engineered Products Co.
7. Erico Products, Inc.
8. Galvan Industries, Inc.
9. GB Electrical, Inc.
10. General Machine Products Co., Inc.
11. Hastings Fiber Glass Products, Inc.
12. Ideal Industries, Inc.
13. Kearney-National.
14. McGill Mfg.
15. O-Z/Gedney Co.

16. Raco, Inc.
17. Thomas & Betts Corp.
18. W.H. Salisbury & Co.
19. Utilco Co.
    Or Approved Equal.

2.2 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper.

2.3 WIRE AND CABLE CONDUCTORS

A. General: Comply with Section 16120 "Wires and Cables." Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Green insulated.

C. Bare Copper Conductors: Conform to the following:

1. Solid Conductors: ASTM B-3.
2. Assembly of Stranded Conductors: ASTM B-8.
3. Tinned Conductors: ASTM B-33.

2.4 MISCELLANEOUS CONDUCTORS

A. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bare copper wire, terminated with copper ferrules.

B. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.5 CONNECTOR PRODUCTS

A. General: Listed and labeled as grounding connectors for the materials used.

B. Pressure Connectors: High-conductivity-plated units.

C. Bolted Clamps: Heavy-duty units listed for the application.

PART 3 - EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. Do not use raceway as the equipment ground conductor.
2. Install separate insulated equipment grounding conductors with circuit conductors.

B. Common Ground Bonding With Lightning Protection System: Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system ground conductor and installed in conduit.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

B. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
2. Make connections with clean bare metal at points of contact.

3. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

B. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.

D. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

3.4 FIELD QUALITY CONTROL

A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System."

B. Ground/resistance maximum values shall be as follows:

1. Equipment rated 500 kVA and less: 10 Ohms
2. Equipment rated 500 kVA to 1000 kVA: 5 Ohms
3. Equipment rated over 1000 kVA: 3 Ohms
4. Unfenced substations and pad-mounted equipment: 5 Ohms
5. Manhole grounds: 10 Ohms

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated the provisions of the Contract, covering changes will apply.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching. Restore disturbed paving as indicated. Perform such work in accordance with industry standards and best trade practices.

-- End of Section --

SECTION 16475

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fuses.
2. Spare fuse cabinet.

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for each fuse type. Include the following:

1. Descriptive data and time-current curves.
2. Let-through current curves for fuses with current limiting characteristics.
3. Coordination charts and tables and related data.

C. Field test reports indicating and interpreting test results.

E. Maintenance data for tripping devices to include in the "Operating and Maintenance Manual" specified in Division 1.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation. All requirements of National Electrical Code, Article 513 - Aircraft Hangars, shall apply.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Single-Source Responsibility: All fuses shall be the product of a single manufacturer.

1.5 EXTRA MATERIALS

A. Furnish the following extra materials that match products installed, packaged with protective covering for storage, and with identification labels clearly describing contents.

B. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than one set of three of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

1. Bussmann Div., Cooper Industries, Inc.
2. Gould Shawmut.
3. Littlefuse, Inc.
Or Approved Equal.

2.2 PLUG FUSES

A. Type: UL 198F, Type S, dual element, time delay.

2.3 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1 nonrenewable cartridge fuse, class as specified or indicated, current rating as

indicated, voltage rating consistent with circuit voltage.

B. Motor Branch Circuits: Class RK1 time delay.

C. Other Branch Circuits: Class RK5 non-time delay.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so that fuse ratings are readable without removing fuse.

3.2 IDENTIFICATION

A. Install typewritten labels on the inside door of each fused switch to indicate fuse replacement information.

-- End of Section --

SECTION 16476

DISCONNECTS AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Feeder and equipment disconnects.
2. Enclosed circuit breakers.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 16475 "Fuses."

1.3 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for switches, circuit breakers, and accessories specified in this Section.

C. Descriptive data and time-current curves for protective devices and let-through current curves for those devices with current-limiting characteristics. Include coordination charts and tables, and related data.

D. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

E. Field test reports indicating and interpreting test results.

F. Maintenance data for tripping devices to include in the "Operating and Maintenance Manual" specified in Division 1.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: In addition to the requirements specified in Division 1, an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

B. Comply with NFPA 70 "National Electrical Code" for components and installation. All requirements of Article 513 - Aircraft Hangars, shall apply.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Single-Source Responsibility: All enclosed switches and circuit breakers shall be the product of a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide enclosed switches and circuit breakers by one of the following:

1. Fusible Switches:

a. Westinghouse Electric Co.
b. Cutler-Hammer.
c. General Electric Co.
d. Siemens, Inc.
e. Square D Co.
Or Approved Equal.

2. Molded-Case Circuit Breakers:

a. Westinghouse Electric Co.
b. Cutler-Hammer.
c. General Electric Co.
d. Siemens, Inc.
e. Square D Co.
Or Approved Equal.

2.2 ENCLOSED SWITCHES

A. Enclosed Nonfusible Switch: NEMA KS 1, Type HD, handle lockable with two (2) padlocks.

B. Enclosed Fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with two (2) padlocks, and interlocked with cover in CLOSED position.

C. Enclosed Fusible Switch Larger Than 800 Amperes: Bolted-pressure or high-pressure contact switch, bus drilled to accommodate specified fuses, enclosure consistent with environment where located.

1. Minimum Fault Current Rating: 200,000 symmetrical rms amperes.
2. Operation: Manually opened and closed.
3. Operation: Manually closed, electrically tripped.
4. Operation: As indicated.
5. Ground-Fault Relay: Solid-state type, field wiring terminals and interface devices to accommodate zone selective control, adjustable pickup current from 100 to 1200 amperes, field-adjustable time delay from instantaneous to 1 second, UL 1053, Class II, monitor panel with ground-fault indicators, control power indicators, TEST and RESET buttons.

6. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

D. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.
2. Other Wet or Damp Indoor Locations: Type 4.
3. Hazardous Areas Indicated on Drawings: NEMA 7C.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Enclosed Molded-Case Circuit Breaker: NEMA AB 1, handle lockable with two (2) padlocks.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated; interrupting capacity rating to meet available fault current, 10,000 symmetrical rms amperes minimum; with appropriate application listing when used for switching fluorescent lighting loads or heating, air conditioning, and refrigeration equipment.

C. Interchangeable Trips: Circuit breakers, 200 amperes and larger, with trip units interchangeable within frame size.

D. Field-Adjustable Trips: Circuit breakers, 400 amperes and larger, with adjustable short time and continuous current settings.

E. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

F. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

G. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

H. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

I. Shunt Trip: Where indicated, 120 volts, 60 Hz.

J. Accessories: As indicated.

K. Enclosure: NEMA AB 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.
2. Other Wet or Damp Indoor Locations: Type 4.
3. Hazardous Areas Indicated on Drawings: NEMA 7C.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosed switches and circuit breakers in locations as indicated, according to manufacturer’s written instructions.

B. Install enclosed switches and circuit breakers level and plumb.

C. Install wiring between enclosed switches and circuit breakers and control/indication devices.

D. Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.2 ADJUSTING

A. Set field-adjustable enclosed switches and circuit breaker trip ranges as indicated.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

3.4 DEMONSTRATION

A. Train Government's maintenance personnel on procedures and schedules for startup and shutdown, troubleshooting, servicing, and preventive maintenance.

B. Review data in the "Operating and Maintenance Manual." Refer to Division 1.

C. Schedule training with Government through the Contracting Officer with at least seven (7) days' advance notice.

-- End of Section --

SECTION 16481

MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 01010 "Summary of Work," apply to this Section.

B. Requirements of the following Division 16 Sections apply to this Section:

1. Section 16010 "Basic Electrical Requirements."
2. Section 16050 "Basic Electrical Materials and Methods."

1.2 SUMMARY

A. This Section includes a.c. motor control devices rated 600 V and below that are not supplied as an integral part of motor/controller packages.

B. Overcurrent protective devices and disconnect switches used with motor controllers are specified in Division 16 Section "Overcurrent Protective Devices."

1.3 DEFINITIONS

A. Motor Controller: A device that controls, protects, and energizes an electric motor, and where required, controls its speed or the torque or power delivered by it.

1.4 SUBMITTALS

A. Refer to Section 01300 "Submittals" for submittal provisions and procedures. Approval by the Contracting Officer must be obtained prior to delivery of materials to the site.

B. Product data for products specified in this Section. Include dimensions, ratings, and data on features and components.

C. Certified reports of field tests and observations specified in "Field Quality Control" in this Section.

D. Maintenance data for products for inclusion in Operating

and Maintenance Manual specified in Division 1 and in Section 16010 "Basic Electrical Requirements."

E. Load Current and Overload Relay Heater List: Compiled by Contractor after motors have been installed. Arrange to demonstrate selection of heaters to suit actual motor nameplate full load currents.

F. Qualification data for field-testing organization certificates, signed by the Contractor, certifying that the organization complies with the requirements specified in "Quality Assurance" below. Include list of completed projects with project names, addresses, names of the Contracting Officer and Government, plus other information specified.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide solid-state, reduced-voltage and solid-state, variable-speed controllers from manufacturers regularly engaged in the manufacture of equipment of the types and capacities indicated, with such products in satisfactory use in similar service for not less than 5 years. Manufacturer must also maintain, within 100 miles of the project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Components and Installation: NFPA 70 "National Electrical Code." All requirements of Article 513 - Aircraft Hangars, shall apply.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. NEMA Compliance: NEMA ICS 2, "Industrial Control Devices, Controllers and Assemblies."

E. UL Compliance: UL 508, "Electric Industrial Control Equipment."

F. Single-Source Responsibility: Obtain similar motor-control devices from a single manufacturer.

G. Field-Testing Organization Qualifications: To qualify for acceptance, a testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.

1.6 COORDINATION

A. General: Coordinate features of controllers and control devices with pilot devices and control circuits provided under Division 15 Sections covering control systems.

1.7 EXTRA MATERIALS

A. Spare Fuses and Indicating Lamps: Furnish one spare for every five (5) installed units, but not less than one (1) set of three (3) of each kind.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Allen-Bradley Co.
2. General Electric Co.
3. Siemens, Inc.
4. Square D Co.
5. Westinghouse Electric. Co.
   Or Approved Equal.

2.2 MOTOR CONTROLLERS, GENERAL

A. Coordinate the features of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, and load, and the pilot device, and control circuit affecting controller functions. Provide controllers that are horsepower rated to suit the motor controlled.

B. Contacts shall open each ungrounded connection to the motor.

C. Overload Relays: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of the specific motor to which connected with appropriate adjustment for duty cycle.

D. Enclosures: For individually mounted motor controllers and control devices, comply with NEMA Standard 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)." Provide enclosures suitable for the environmental conditions at the controller location. Provide NEMA Type 1 enclosures except as otherwise indicated.

2.3 MANUAL MOTOR CONTROLLERS

A. Description: Quick-make, quick-break toggle action.

2.4 MAGNETIC MOTOR CONTROLLERS

A. Description: Provide full-voltage, nonreversing, across-the-line, magnetic controller, except where another type is indicated.

B. Control Circuit: 120 V. Provide control power transformer integral with controller where no other supply of 120 V control power to controller is indicated. Provide control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Switch type; fused or nonfused as indicated; quick-make, quick-break switch; factory assembled with controller and arranged to disconnect it. For fused switches, provide rejection-type fuse clips and fuses rated as indicated. Interlock switch with unit cover or door.

D. Combination Controller: Motor circuit protector; molded-case circuit-breaker type with magnetic-only trip element calibrated to coordinate with the actual locked-rotor current of the connected motor and the controller overload relays. Provide breakers that are factory assembled with the controller, interlocked with unit cover or door, and arranged to disconnect the controller. Provide motor-circuit protectors with field-adjustable trip elements.

E. Enhanced-Protection Overload Relay: Provide overload relays with NEMA Class 10 tripping characteristics where indicated. Select to protect motor against voltage unbalance and single phasing.

2.5 MULTISPEED MOTOR CONTROLLERS

A. General: Match controller to motor type, application, and to number of speeds. Conform to Article "Magnetic Motor Controllers" above. Provide auxiliary devices as indicated. Provide all required relays factory installed in controller enclosure.

B. Controller for Consequent Pole Motor: Provide number of poles to suit motor speeds indicated. Select controller to suit motor type indicated.

C. Controller for Separate Winding Motor: Provide number of contactors to suit motor speeds indicated. Select controller to suit motor type indicated.

D. Compelling Relay: Arrange to assure motor will start only at low speed.

E. Accelerating Relay: Provide for selection of ultimate motor speed by pushbutton or pilot device as indicated with automatic timed acceleration through any speeds lower than that selected.

F. Decelerating Relay: Provide selection of lower than current operating speed by pushbutton or pilot device as indicated with deceleration automatically timed through any intervening speeds.

2.6 REDUCED-VOLTAGE MOTOR CONTROLLERS

A. Star-Delta Magnetic Type: Closed transition with adjustable time delay.

B. Part Winding Magnetic Type: Closed transition with separate overload relays for starting and running sequences.

C. Autotransformer Magnetic Type: Closed transition.

D. Solid-State Type: Suitable for use with standard NEMA Design B, 3-phase induction motors, providing adjustable acceleration rate control using voltage or current ramp. Provide adjustable starting torque control with up to 500 percent current limitation for 20 seconds. Provide surge suppressor in solid-state power circuits to provide 3-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage. Provide snubbers to prevent malfunction due to system voltage transients. Provide overload protection for NEMA Class 10 or better. Provide LEDs to indicate motor and

control status including control power available, controller on, overload trip, loss of phase, and shorted SCR.

1. Provide automatic voltage reduction controls to reduce voltage when motor is running at light load.
2. Provide a motor running contactor to operate automatically when full voltage is applied to motor. Controller shall operate as a magnetic motor controller except during starting of motor.

2.7 SOLID-STATE, VARIABLE-SPEED MOTOR CONTROLLERS

A. General: Provide controllers listed and labeled as a complete unit and arranged to provide variable speed of a standard NEMA Design B, 3-phase, induction motor by adjusting output voltage and frequency of controller. Controller shall be designed and rated by the manufacturer for the type of load (e.g., fans, blowers, and pumps) with which used. Controller shall also be approved by the manufacturer for the type of connection used between the motor and load (direct connection or power transmission connection).

B. Isolation Transformer: 1-to-1 ratio, with capacity coordinated by the manufacturer for the controller, motor, drive, and load combination.

C. Ratings: As follows:

1. Output Rating: 3-phase, 6 to 60 Hz, with voltage proportional to frequency throughout the voltage range.
2. Output Rating: 3-phase, 6 to 66 Hz, with torque constant as speed changes.
3. Output Rating: 3-phase, 6 to 120 Hz, with horsepower constant throughout the speed range.
4. Starting Torque: 100 percent of rated torque, or as indicated.
5. Speed Regulation: Plus or minus 1 percent.
6. Ambient Temperature: 0 deg C to 40 deg C.
7. Efficiency: 95 percent minimum at full load, 60 Hz.

D. Isolated control interface to allow the controller to follow one of the following over an 11:1 speed range:

1. Electrical Signal: 4 to 20 milliamperes at 24 V.
2. Pneumatic Signal: 3 to 15 psig.

E. Internal Adjustability: Provide the following internal adjustment capabilities:

1. Minimum Speed: 5 to 25 percent of maximum RPM.
2. Maximum Speed: 80 to 100 percent of maximum RPM.
3. Acceleration: 2 to 22 seconds.
4. Deceleration: 2 to 22 seconds.
5. Current Limit: 50 to 110 percent of maximum rating.

F. Multiple Motor Capability: Controller suitable for service to multiple motors, and furnished with a separate overload relay and protection for each individual motor. Tripping of any overload relay shall shut off the controller and all motors served by it.

G. Self-protection and reliability features shall include:

1. Input transient protection by means of surge suppressors.
2. Snubber networks to protect against malfunction due to system voltage transients.
3. Motor Overload Relay: Adjustable and capable of NEMA class 10 performance.
4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
5. Instantaneous Overcurrent Trip.
6. Loss of Phase Protection.
7. Reverse Phase Protection.
8. Under- and Over-Voltage Trips.
9. Overtemperature Trip.
10. Short Circuit Protection.

H. Automatic Reset/Restart: Attempt 3 restarts after controller fault or on return of power to the system following an interruption and before shutting down for manual reset or fault correction. Provide for restarting during deceleration without damage to the controller, motor, or load.

I. Power Interruption Protection: Prevent motor reenergizing after a power interruption until motor has stopped.

J. Operation and maintenance features shall include:

1. Status Lights: Door-mounted LED indicators to indicate power on, run, overvoltage, line fault, overcurrent, and external fault.
2. Elapsed Time Meter.
3. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer.

4. Current-Voltage-Frequency Indicating Devices: Mount meters or digital readout device and selector switch flush in controller door and connect to indicate controller output.
5. Manual Bypass: Magnetic contactor arranged to safely transfer the motor from the controller to the power line, or from the line to the controller while the motor is at zero speed. Include Controller-Off-Bypass selector switch and indicator lights to indicate mode selection.
6. Integral Main Disconnect: Circuit breaker connected to shut down all power to both the controller and the bypass. Interlock breaker with cabinet door.
7. Auxiliary Motor Contactors: Electrically interlocked. One contactor connected between the controller output and the motor, controlled by the controller regulator; and one between the bypass power line and the motor, providing across-the-line starting capability in the bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode.
8. Isolating Circuit Breaker: Arranged to electrically isolate the variable-speed controller to permit safe trouble-shooting and testing of the controller, both energized and de-energized, while the motor is operating in the bypass mode.
9. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

2.8 AUXILIARY CONTROL DEVICES

A. General: Factory installed in controller enclosure except as otherwise indicated. Where separately mounted, provide NEMA 1 enclosure except as otherwise indicated.

B. Pushbutton Stations, Pilot Lights, and Selector Switches: Heavy-duty type.

C. Stop and Lockout Pushbutton Station: Momentary-break pushbutton station with a factory-applied hasp arranged so a padlock can be used to lock the pushbutton in the depressed position with the control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Elapsed Time Meters: Heavy duty with digital readout in hours.

F. Ammeters, Voltmeters, and Frequency Meters: Panel type,

2-1/2-inch minimum size with 90-deg or 120-deg scale and plus or minus 2-percent accuracy. Where indicated, provide transfer device with an off position.

G. Current Sensors: Rated to suit application.

H. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.

I. Current-Sensing, Phase-Failure Relay: Solid-state sensing circuit with isolated contacts for hard-wired connection. Arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage. Provide adjustable response delay.

PART 3 - EXECUTION

3.1 APPLICATION

A. Manual Controllers: Use for single-phase motors except as indicated. Use for manually controlled three-phase motors up to 5-horsepower at 208-240 V a.c. and up to 7-1/2 horsepower at 480 V.

B. Pushbutton Stations: Except as otherwise indicated, momentary-contact, start-stop units. Provide in covers of magnetic controllers for manually started motors where indicated, and connect start contact in parallel with sealing auxiliary contact for low-voltage protection.

C. Hand-Off-Automatic Selector Switches: Except as otherwise indicated, install in covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment. Make control connections so only the manual and automatic control devices that have no safety functions will be bypassed when the switch is in the hand position. Connect motor-control circuit in both hand and automatic positions for safety type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors. Make control-circuit connections to a hand-off-automatic switch or to more than one automatic control device in accordance with an indicated wiring diagram or one that is manufacturer approved.

3.2 INSTALLATION

A. General: Install independently mounted motor control devices in accordance with manufacturer’s written instructions.

B. Manufacturer’s Field Services: Arrange and pay for the services of a factory-authorized service representative to inspect the field assembly and connection of components, and supervise the pretesting and adjustment of solid-state controllers.

C. Location: Locate controllers as indicated and within sight of motors controlled.

D. Mounting: For control equipment at walls, bolt units to wall or mount on light-weight structural steel channels bolted to the wall. For controllers not at walls, provide freestanding racks fabricated of structural steel members and light-weight slotted structural steel channels. Use feet consisting of 3/8-inch thick steel plates, 6 inches square, bolted to the floor. Use feet for welded attachment of 1-1/2-inch by 1-1/2-inch by 1/4-inch vertical angle posts not over three feet on centers. Connect the posts with horizontal lightweight slotted steel channels and bolt the control equipment to the channels.

E. Motor-Controller Fuses: Conform to requirements of Section 16475, “Fuses”.

3.3 IDENTIFICATION

A. Identify motor control components and control wiring in accordance with Section 16195, "Electrical Identification."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor control devices and control/indicating devices as specified in Section 16120 "Wires and Cables" for hard-wired connections.

B. Install wiring in enclosures neatly bundled, trained, and supported.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment

manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, comply with tightening torques specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Independent Testing Organization: Arrange and pay for the services of an independent electrical testing organization to perform tests and observations on motor control devices.

B. Reports: Prepare written reports certified by testing organization of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include records of repairs and adjustments made.

C. Labeling: On satisfactory completion of tests and related effort, apply a label to tested components indicating test results, date, and responsible organization and person.

D. Schedule visual and mechanical inspections and electrical tests with at least one week's advance notification.

E. Pretesting: On completing installation of the system, perform the following preparations for tests:

1. Make insulation resistance tests of conducting parts of motor control components; and of connecting supply, feeder, and control circuits. For devices containing solid-state components, use test equipment and methods recommended by the manufacturer.
2. Make continuity tests of circuits.
3. Provide set of Contract Documents to test personnel. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.
4. Provide manufacturer's instructions for installation and testing of motor control devices to test personnel.

F. Visual and mechanical inspection: Include the following inspections and related work.

1. Motor-Control Device Ratings and Settings: Verify that ratings and settings as installed are appropriate for final loads and final system arrangement and parameters. Recommend final protective-device ratings and settings where

differences are found. Use accepted revised ratings or settings to make the final system adjustments. Prepare and submit the load current and overload relay heater list.

2. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current project drawings.
3. Exercise and perform operational tests of mechanical components and other operable devices in accordance with manufacturer's instructions.
4. Check tightness of electrical connections of devices with calibrated torque wrench. Use manufacturer's recommended torque values.
5. Clean devices using manufacturer's approved methods and materials.
6. Verify proper fuse types and ratings in fusible devices.

G. Electrical Tests: Perform the following in accordance with manufacturer's instructions:

1. Insulation resistance test of motor control devices conducting parts to the extent permitted by the manufacturer's instructions. Insulation resistance less than 100 megohms is not acceptable.
2. Use primary current injection to check performance characteristics of motor-circuit protectors and for overload relays of controllers for motors 15 horsepower and larger. Trip characteristics not within manufacturer's published time-current tolerances are not acceptable.
3. Make adjustments for final settings of adjustable-trip devices.
4. Test auxiliary protective features such as loss of phase, phase unbalance and undervoltage to verify operation.
5. Check for improper voltages at terminals in controllers that have external control wiring when controller disconnect is opened. Any voltage over 30 V is unacceptable.

H. Correct deficiencies and retest motor control devices. Verify by the system tests that specified requirements are met.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

3.8 DEMONSTRATION

A. Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate solid-state and variable-speed controllers and train all personnel as designated by W.A.R.B.

B. Conduct a minimum of 4 hours of training in operation and maintenance as specified under "Instructions to Government’s Employees" in Division 1. Include training relating to equipment operation and maintenance procedures.

C. Schedule training with at least seven (7) days advance notification.

-- End of Section --